The Monthly Review of the AMERICAN ELECTROPLATERS' SOCIETY

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JULY 1940

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The Monthly Review

Published by the AMERICAN ELECTROPLATERS' SOCIETY, Inc.

A Society for the Advancement of the Science of Electroplating

JULY 1940

I pledge allegiance to the Flag of the United States of America and to the Republic for which it stands, one Nation indivisible, with liberty and justice for all

W. J. R. KENNEDY, *Editor*
W. W. McCORD, *Associate Editor*

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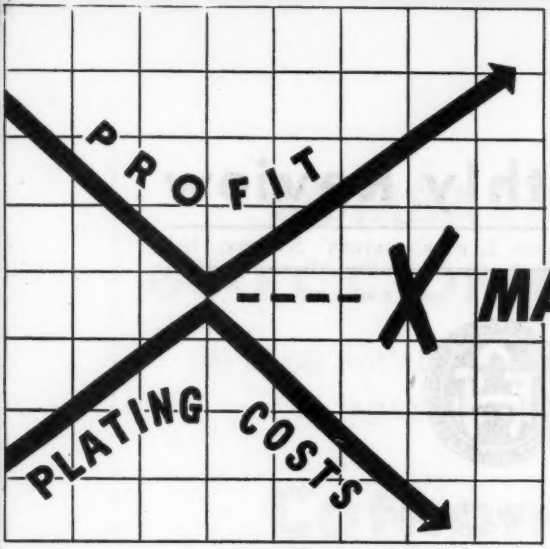

MARKS THE SPOT

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The Monthly Review

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VOL. XXVII JULY 1940 NO. 7

Editorial

On Friday morning following the close of the Dayton Convention the new executive board met for over three hours to discuss the mandates of the delegates and to plan appropriate action for the ensuing year.

Each former incumbent has turned over to his successor the correspondence and business detail of his office and each new officer has been requested to submit a plan of operation for the season to govern his office. How far these plans have progressed may be found in the pages of the "Review" from time to time, some beginning this month.

It is to be hoped that the remaining months before again meeting in Boston will be equally as productive of good business methods as have been the first few weeks and in fact the watchword of the present administration is going to be "for A.E.S. business," by which is meant getting things done in a business-like way as you, as members, would wish to see them performed but—bear in mind that no administration can be better than the cooperation given its leaders by the individual policy makers, its membership.

It is desired to have the majority sentiment prevail in all plans, but this cannot be sensed without expression; so please write and talk freely, both as individuals and as branches for the benefit of your executive board's understanding of your wishes. This does not mean that something will necessarily be done when requested by one individual or branch; but it does mean that due consideration will be given each communication and if affecting the whole organization in any way, will be placed before it in such a manner as to learn the general desires.

There will be no attempt at arbitrary dictation at any time, on any subject; which statement is almost superfluous as applied to our membership, wherein our meetings on common ground with open minds and hearts are almost traditional and not lightly to be broken, but no harm can result by restating a well established policy from newly elected officers to reassure all of their understanding of this cardinal policy.

In order to further the unity of officership and membership an

effort will be made to have at least some board member visit each branch at least once during the season, (always provided the travel appropriation is not overdrawn) and so that they may not come empty handed each one has been requested to prepare a talk on a subject of interest to platers in addition to any business discussion presented. Get your requests in early as the supply is limited.

We all trust that the errors of the past can be remolded into more perfect achievements of the present and future; while it is axiomatic with this administration to confront fearlessly any errors brought to attention and endeavor to so use them that the past mistakes will be eclipsed in the brilliance of their view when presented from the brighter side in true form, thereby rebounding to greater credit for the original transgressor who inadvertently improved some phase of our activities the hard way.

It would be possible to continue for several pages expounding the viewpoint of your present officership and their rapport with the aims and ideals of our society, but space would not permit even if the end of reader patience had not been reached; so that it only remains to express appreciation of the excellent results achieved by the Dayton branch under the able direction of Mr. Conley and his committees, not forgetting the complete entertainment given the ladies under the guidance of Mrs. Conley and Mrs. Cochrane as well as expressing many thanks to our friends, the Good Fellowship Club, and to further extend a personal appreciation to all of the branches and delegates for their confidence in electing me to the position so highly respected by your president.

FREDERICK FULFORTH

The Employment Committee

Several months ago a prominent member of one of our largest branches suggested that something be done about securing suitable employment for members of the A.E.S. who are out of work and whose services would be of value to employers having positions open for electroplaters. It is our desire to be as helpful as possible in this connection. To this end the following letter has been sent to each branch secretary with the hope that by closer cooperation we may be able to establish a Bureau of information that will be beneficial to unemployed members and manufacturers seeking desirable plating room operators or supervisors as the case may be.

"We have been asked to call to the attention of our Secretaries, Article IV, Section 12, Page 11, of the Constitution and By-laws which reads as follows:

"EMPLOYMENT COMMITTEE: The Executive Secretary shall be the chairman of the Employment Committee which shall consist of the Secretaries of all branches. This committee will assist employers to secure qualified platers who are members of Branch societies and shall assist unemployed members to secure employment as platers."

The object of this letter is obvious. We want you to write us regarding positions that are open for platers, also platers desiring employment. We would like to have an available list of such members in our files, should there be a request from reliable concerns for the services of one or more of our members. We receive such requests occasionally, but more often we are asked to find employment for a member out of work.

It is our desire to provide the necessary space in the REVIEW to advertise such positions so that competent help may be procured by employers and at the same time it would help to secure desirable positions for our members. All such advertising would, of course, be free of charge.

In order to give the matter full publicity, we are asking you to read this letter at your next branch meeting.

Very truly yours,
EXECUTIVE SECRETARY"

JOE BARRON
General Chairman of the 1941 Convention Committee

Membership Campaign

BRANCH	May 1, 1940	July 1, 1940	Gain or Loss	percent Loss	percent Gain
Lancaster	25	30	+5		20.0
Cincinnati	36	42	+6		16.7
Montreal	23	26	+3		13.0
Rochester	62	69	+7		11.3
Grand Rapids	54	60	+6		11.1
Springfield	49	54	+5		10.2
Boston	80	88	+8		10.0
Toledo	42	46	+4		9.5
Cleveland	75	80	+5		6.7
Bing.-Syracuse	23	24	+1		4.4
Chicago	230	235	+5		2.2
New York	100	102	+2		2.0
Bridgeport	64	65	+1		1.6
Waterbury	66	67	+1		1.5
Buffalo	42	42	0		
Anderson	36	36	0		
Dayton	62	62	0		
Los Angeles	64	64	0		
Newark	123	123	0		
New Haven	115	115	0		
Philadelphia*	137	137	0		
Prov.-Attleboro	39	39	0		
St. Louis	74	74	0		
San Francisco	19	19	0		
Detroit	250	249	—1	0.4	
Milwaukee	78	77	—1	1.3	
Toronto	67	66	—1	1.5	
Baltimore-Wash.	49	48	—1	2.0	
Hartford	45	44	—1	2.2	
Pittsburgh	32	30	—2	6.1	

*—Four members not officially transferred from Philadelphia to Lancaster Branch.
NOTE: Honorary members are included with each Branch.

Auxiliary Equipment *for the* Electroplater

As an aid to Production Efficiency

By M. B. SHIRLEY
Junior Member A. I. M. E.

THE modern industrial laboratory contains very accurate equipment for controlling industrial processes, but so often this apparatus is very costly and entirely out of reach of the plater who has not a skilled chemist to use it. And indeed the management of large factories are reluctant to spend sums of money upon nonproductive equipment.

Today, however, even the man with but a single Copper, Nickel and Chrome Vat cannot afford to be without some simple but effective method of testing his output other than visual inspection. If he is undertaking work for the Air Ministry or other official body, he will find it in his interest to satisfy himself that there are no weak spots on any part of a plated job. The mass producer will find that increased efficiency of both cathode and anode can be obtained besides a possibility of further increased output from the same vats.

If a chemist is available, the apparatus should be housed in the laboratory. But in any case, the foreman plater should be familiar both with the method of use and with the object in view in each case, also with the conclusions which may be drawn and the limitations of the tests.

Such an arrangement will give the best results and co-operation between personnel and operators.

The first piece of apparatus the writer will describe is the Ultra Violet lamp. This lamp operates direct from AC mains through a choke and emits rays of invisible light of extremely short wavelength between A°2,000 and 3,000A°. These rays, known as Ultra Violet, possess peculiar properties. For instance, they are completely absorbed by ordinary glass and so no glass must be interposed between an article being viewed and the lamp. There are, of course, special glasses which allow Ultra Violet rays to pass completely through them, such as Vita Glass and Wood's Ultra Violet filter glass. Owing to their short wave length, they have

the property of making some otherwise invisible substance fluoresce or become self luminous. Such a substance is red ink. Invisible in a dark box, it glows with a bright yellow light when in the path of Ultra Violet rays. When, however, the rays are absorbed at the surface the object appears either black, and therefore nearly invisible, or a deep purple colour depending upon the material and the nature of the surface. These can be used to advantage by the Plater when an article has reached the final polishing stage, say 150 greased emery, prior to cleaning for plating. If it is viewed in Ultra Violet light, small imperfections in the "mirror" surface will become visible which were previously invisible, in many cases unremoved scratches, as from a coarser grade emery, will be detected. Furthermore, the buffing of chrome, when necessary can be done with ease, as the danger of penetrating through to the nickel coating becomes less, owing to the fact that polished nickel appears yellow under Ultra Violet whereas chrome appears white in reflected Ultra Violet light.

The slightest trace of unremoved nickel can thus be seen on a piece that is being repolished or if only the chrome has to be removed, then the job is very much easier to perform. The time required by the Inspection Department is also lessened.

If the whole process of polishing is conducted in Ultra Violet light, it will be found that not only the operators appreciate it but the number of rejections falls heavily and the whole operation is speeded up. The piece work time may be greatly reduced leading to increased efficiency and lower costs all around.

These lamps supplied with a special choke are easily obtained from the large electric lamp manufacturers, at small cost, have a fairly long life, and are cheap to operate. They are best fitted on the roof directly above each polishing lathe at a fair distance above to minimise shadows. There are two types of lamps made which emit ultra violet. One is an ordinary electric light plus ultra violet and therefore a vivid white light. The other type emits only ultra violet and consequently a violet light. The first type should be used for the polishing shops. The slight difference of colour of ordinary objects at first is slightly disconcerting since red lips appear deep blue but this is soon overcome.

Having now increased the efficiency of the polishing shop, we may apply the lamp to the degreasing process. Whether Trichlorethylene or Caustic Cleansing is being used, it is often an advan-

tage to be quite certain that the degreasing has been satisfactorily performed. Now most oils and greases will fluoresce in Ultra Violet light. Mineral oils show up a bright azure blue colour, whilst vegetable oils show up a dark brownish yellow.

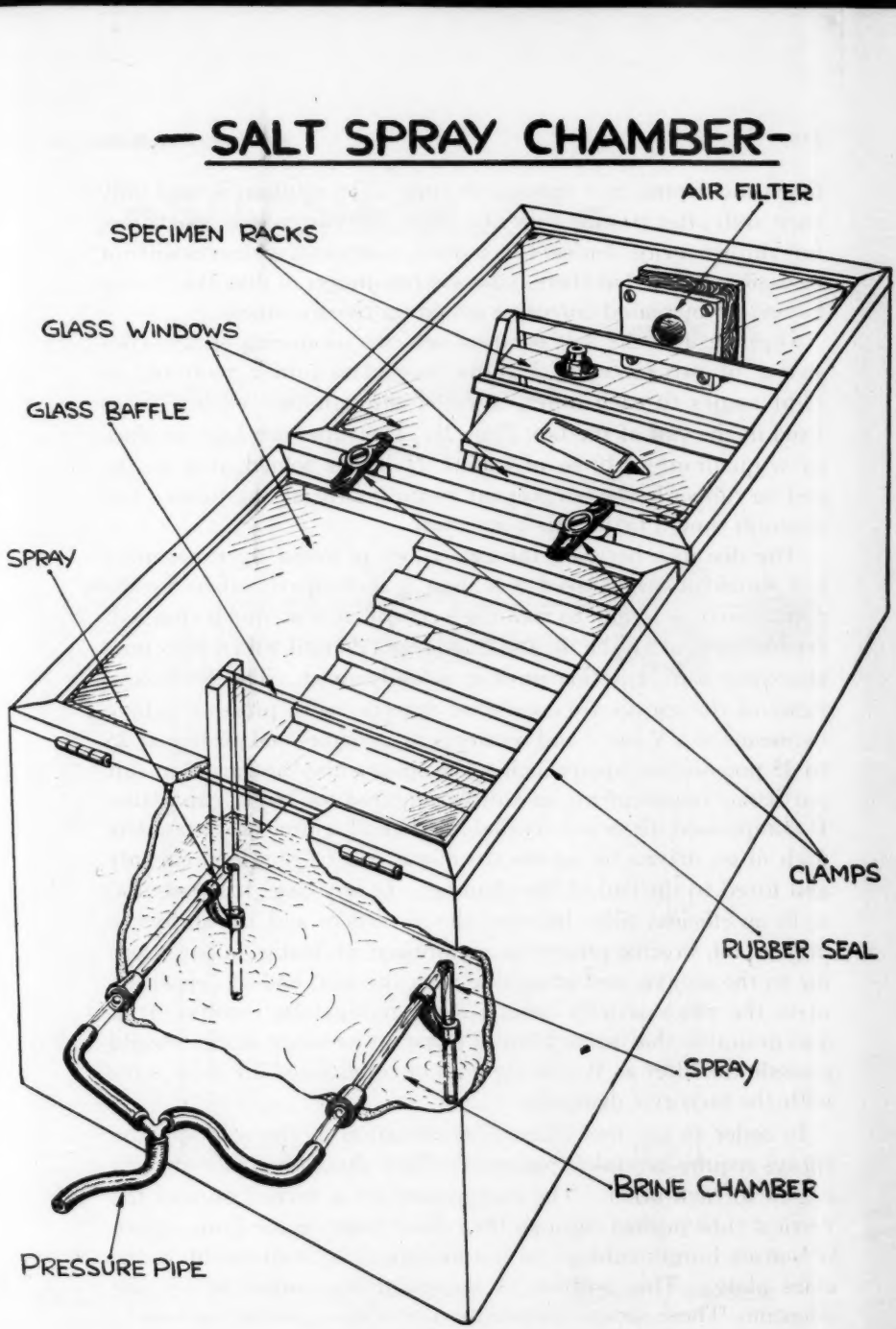
A piece of clean metal handled only once with slightly greasy hands will show up the slightest trace of grease. Films of less than 1/1000 of an inch thick and more than 1/100 of an inch diameter can readily be detected. For this purpose it is better to use the type of lamp which emits ultra violet light only, as this reduces the strain on the operator's eyes and enables the object to be viewed more critically. By housing a lamp of this type suitably shaded in a dark box which will exclude daylight on three sides, the plater is enabled to carry out a very rapid and efficient pre-plate inspection. An inspection bench is best placed between the final rinse of the degreasing system and the man loading the vats. A girl can easily inspect several thousand small pieces an hour. The foreman plater can then rest assured that the articles are clean before deposition. Not only may grease be readily detected but also rust spots or unpolished bits of an otherwise perfectly polished piece. Rust on a polished piece will cause the Ultra Violet light to be absorbed so that the spot will appear as a dark nearly black patch when the article is tilted relative to the rays so that the smallest amount of light is reflected to the observer's eye.

This latter use is really an accessory of the "Salt Spray," so that it would be desirable to describe this first. Most platers will be familiar with the term "Salt Spray" test, but how many actually have one in operation, and how many less test each fresh batch of articles put through? It consists essentially of completely surrounding the plated article with a highly atomized dense mist of common salt solution, and aims at producing a speeded up weathering action of "Life Test." After prolonged exposure, it penetrates the deposit and attacks the base metal itself. This is readily detected by inspection (e. g. nickel or steel shows rust spots). The test is fairly rapid in operation and specimens will show signs of breakdown after a few hours if the plate is not good. Chemical attack is centered at the pores of the deposit, cracks or any other imperfections. It is not a quantitative method in that resistance of a deposit to so many hours' spray is exactly equivalent to so many months' practical service conditions, but it is a

very useful guide to the result likely to be obtained in practice. In works practice the spray is usually continuous during the working hours when it can be watched. The spray is put off last thing at night and the specimens allowed to remain in overnight. This is the 8 or 16 off system and is in general use.

Where it is known that a long period will be necessary to break down the deposit, the continuous process will be advantageous, but results for the same length of time of spray intermittently will be found to differ somewhat. As a rough guide to the length of time required using the intermittent system, it may be said that with 5 per cent brine 100 hours resistance is indicative of a satisfactory coating. 100 hours may be reckoned as three years of normal service but it is better for each plant, however, to work to their own special requirements and by experiment determine a satisfactory resistance period rather than draw to a definite conclusion from other users, because results are more comparative when all taken from the same apparatus.

The apparatus required consists of a rectangular wooden box suitably protected on the inner surface with anticorrosive paint. The average carpenter can make it quite easily. The best material, if it is available, is teak, as it tends to warp less than other woods. All joints should be watertight and a suitable drain cock provided to each compartment (See Fig. 1). There is a sheet of plate glass separating the new salt solution from the used salt solution. The plate is conveniently set in putty to prevent leakage from one compartment to the other. An inclined rack is provided for supporting specimens, to prevent solution coming in contact with them and to ensure that the deposited liquid runs away freely. A filter of glass wool is put on the opposite side of the spray chamber to allow free escape of air. If a filter is not used it will be found that the escape of salt vapour soon fills the room. The top is fitted with two hinged glass lids which are clamped down on rubber seatings. It is essential to see that the lids seat well on the rubber, otherwise salt vapour escapes this way, as a liquid, and runs down the outside of the box, forming a crystalline deposit on the sides. The size as shown on the sketch proves to be satisfactory for general use. The salt solution is five per cent neutral sodium chloride. This has been chosen after experimental work as being a suitable concentration for normal thickness of plate. Heavier coats may require higher concentration to break


— SALT SPRAY CHAMBER —
AIR FILTER
SPECIMEN RACKS
GLASS WINDOWS
GLASS BAFFLE
SPRAY
CLAMPS
RUBBER SEAL
SPRAY
BRINE CHAMBER
PRESSURE PIPE

— FIG. 1 —

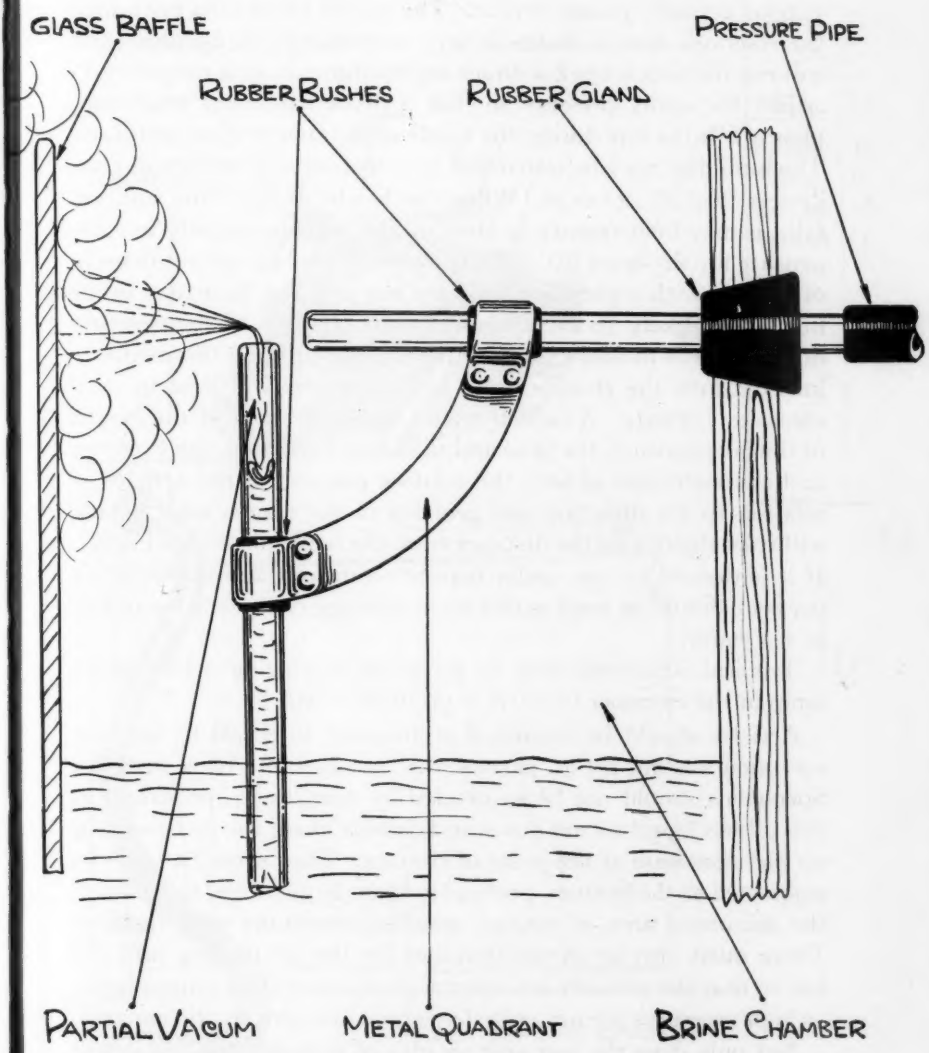
down the deposit in a reasonable time. The solution is used only once and, after passing over the other side of the glass partition, it is thrown away. Unless this is done, comparative results will not be easily obtained as there is always the danger of dissolved metal having an increased corrosive action on the specimens.

Dipping into the salt solution are two atomizing sprays consisting of two pieces of 3/16ths bore glass tubing mounted at right angles to each other, inserted through two rubber bungs fixed in the end of the box (Fig. 2). The tubes are kept in place by a quadrant of brass of radius $2\frac{1}{2}$ inches folded over at the end on rubber bushes to prevent strain fracturing the tubes. The diagram should make this quite clear.

The distance between the two tubes is found by experiment but should not be placed less than $\frac{1}{8}$ inch apart, otherwise the compressed air tends to cool the vertical tube so much that salt crystallizes out on the tip and builds up a deposit which soon puts the spray out of action until it is redissolved. The horizontal tubes of the sprays are connected together with pressure tubing by means of a Y-piece and connects to a compressed air line at 25 to 35 pounds per square inch. The sprays may be varied to suit particular requirements as will be required for larger capacities. If compressed air is not available, a small compressor complete with filter, driven by an electro motor can be obtained cheaply and fitted to the end of the chamber. In any case, it is essential to fit an efficient filter between the air intake and the sprays to prevent oil, so often present in compressed air, leaking along, passing to the sprays, and atomizing with the salt, and so depositing upon the clean articles being tested, giving false results. It is also desirable that some form of constant pressure device should precede the filter as Works supplies of compressed air often vary with the factory's demands.

In order to get the ultimate atomization of the solution, the sprays require careful adjustment. They should be truly at right angles to each other. The compressed air is turned on and the vertical tube pushed through the rubber bush (made from a piece of bunsen burner tubing) until a fine spray is produced upon the glass plate. This position is approximately indicated by the diagram. These sprays operate by producing a partial vacuum in the vertical tube owing to the passage of air against the end and so the solution rises to meet further air where it is blown away from

-SALT SPRAY JET-



-FIG. 2-

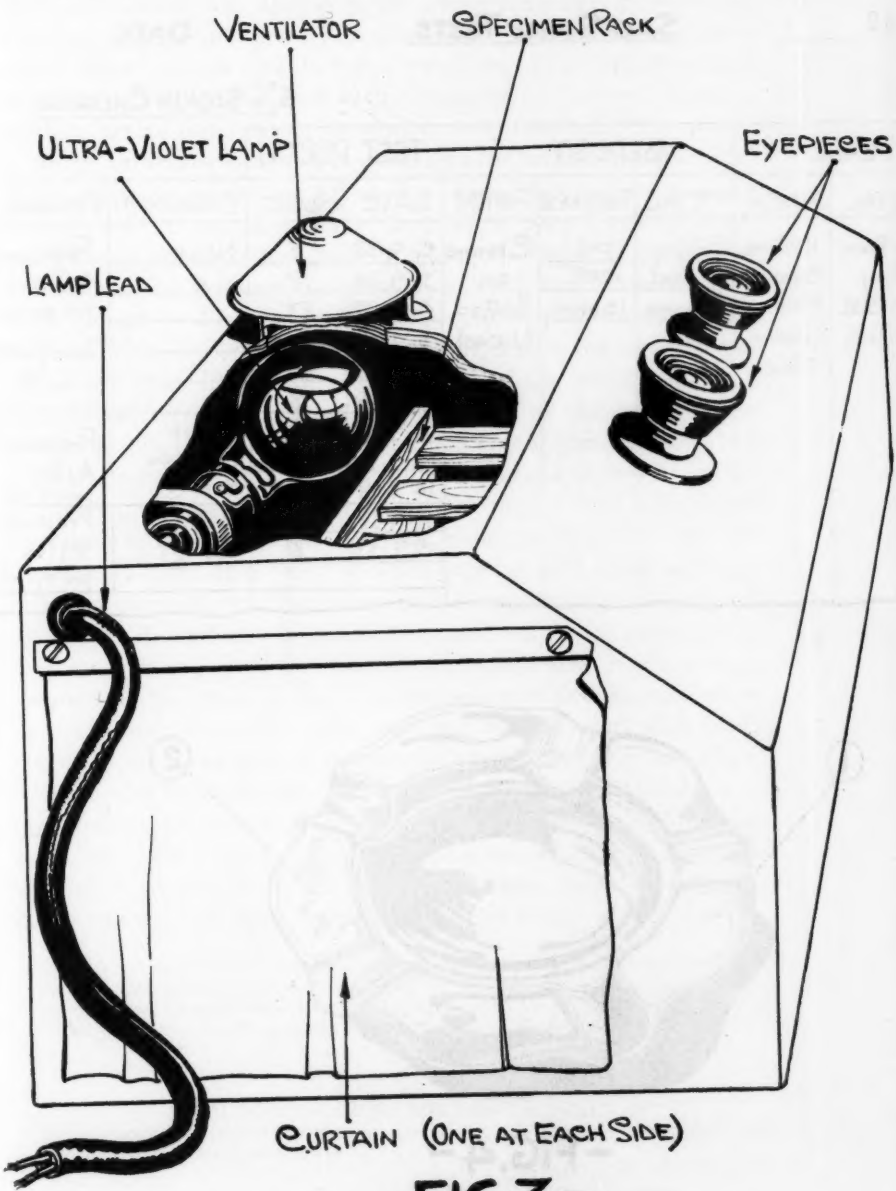
the tube and so atomized. The action of the glass plate is twofold — to keep the solutions separate and to act as a baffle to the sprays, preventing direct impingement of the spray of air and liquid upon the articles being tested. Hence only a very fine vapour actually passes over it. The excess liquid falls back into the reservoir and so makes it very economical. A 6-gallon tank will run for over a week without replenishment. It is necessary to adjust the spray pressure so that a dense saturated mist completely fills the box during the whole of the time it is in operation. The humidity may be controlled by a hydrometer and should not be less than 97 per cent. When the height of the brine solution falls, it may be necessary to increase the pressure slightly to compensate for the extra lift. The maintenance of a constant density of vapour with a constant pressure is a problem that may occur but is not likely to be serious. Small changes of temperature do not appear to affect the results very much, but a thermometer inserted into the chamber and kept constant will lead to very consistant results. A careful record should be kept of the length of time of exposure, the type and thickness of plating, the Pressure and concentration of salt, the relative position of the articles in relation to the direction and position of the sprays since attack will vary slightly on the distance from the baffle plate (See Fig. 2). If it is desired to test under marine conditions, a solution of 3.1 per cent should be used as this is the average concentration of salt in sea water.

Tropical conditions may be produced by rigging a 1000 Watt lamp in the chamber to warm it up to 80° – 90° F.

Articles should be examined at frequent intervals to see that corrosion has not set in, particularly on edges and back surfaces. Specimens should not be suspended by wire, twine, or string, as this allows liquid to run down and dribble along the piece setting up bad corrosion at the point of contact. They should always be supported at the bottom, preferably upon large rubber bungs with the minimum area of contact possible consistant with rigidity. There must also be adequate outlet for the air passing into the box so that the pressure is not appreciably more than atmospheric, as high pressures are not only dangerous but give erratic results.

Not only does the test give an idea of probable life but it will tell the plater whether or not there are soft spots on the deposit and whether it is at all porous. If it is porous, corrosion spores will

-ULTRA-VIOLET RAY VIEWING CABINET-

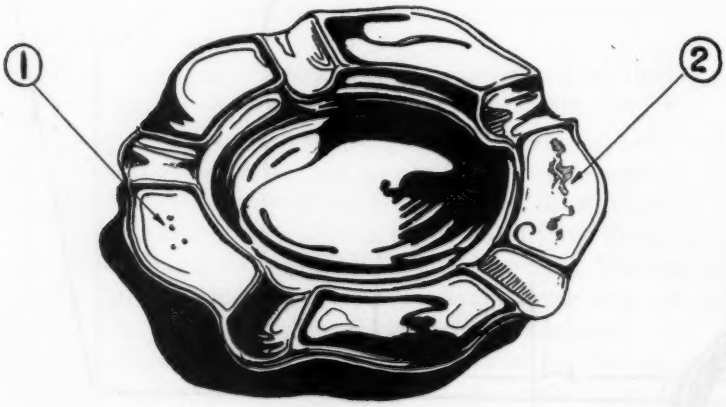


-FIG.3-

Nº **SALT SPRAY TESTS** **DATE**

5% SODIUM CHLORIDE

BASE		DEPOSIT			TEST PERIOD			
METAL	FINISH	METAL	THICKNESS	FINISH	DATE	HOURS	BREAKDOWN	REMARKS
Zn. Base Alloy Die Cast Ash Tray	120 Em. Grease Mop. Lime—Finish	Copper	.001"	Chrome on Buffed Nickel	2.9.38	8	None	Pressure 40 lbs. per sq. inch Temperature 61°F.
		Nickel	.002"		3.9.38	8	"	
		Chrome	10 Mins.		4.9.38	7	"	
					5.9.38	8	"	
					6.9.38	6	"	
					7.9.38	8	"	
					8.9.38	8	4 Spots of Corrosion See (1).	Pressure 41 lbs per sq. inch
					9.9.38	6		
					10.9.38	8		
					11.9.38	8	String of Spores See (2)	Pressure 39 lbs. per sq. inch
					12.9.38	8		



-FIG. 4-

appear on the surface of the plate which can easily be scraped off. Isolated patches may appear or the whole plate may be corroded away over quite an area. For this reason it is useful to draw a rough sketch of the articles being tested on the record sheet and mark any corrosion centers with a number for future reference so that further patches can be more closely watched.

As an aid to inspection of the coatings for breakdown the Ultra Violet lamp is invaluable. The first signs of breakdown of the deposit will be shown as dark spots sometimes invisible in ordinary light but showing up easily under the lamp. In the case of aluminum, for instance, anodically treated, the mere trace of oxide caused by a breakdown of the protective film shows up as a brilliant white under the ultra violet light, due to the formation of aluminum oxide Al_2O_3 whereas the rest of the piece remains a dark violet colour. A small magnification of the object when viewed facilitates searching for corrosion spores and a viewing box was constructed by the writer similar to the one shown in Figure 3. The magnification was effected by fitting two achromatic stereoscopic lenses so that the piece could be viewed in the box during daylight. It is made of wood painted with matt jet black paint on the interior. The lenses give a magnification of approximately $3\frac{1}{2}$ diameters which will be found ample for general use. The lamp is mounted horizontally although this is not recommended by the makers, but it is necessary to get the maximum light emitted vertically. The sides are also covered with black velvet to enable articles to be inserted easily. The Salt spray and Ultra Violet lamp should therefore find a permanent position in the equipment of the progressive electro depositor. Although their use has not yet been explored, it is known that they can be used with advantage in the testing of paints, varnishes and lacquers, in fact with most types of protective films.

This article is by Marcum B. Shirley, Junior Member A.I.M.E., Glasgow, Scotland. In a recent letter, Mr. Shirley writes as follows: "Shortly, I hope to let you have another article describing a new apparatus for controlling the quality of polish of electroplated articles for which invention I was recently awarded the "Hepburn Prize" of the Royal Scottish Society of Arts."

CABLEGRAM FROM MR. HOTHERSALL

Deeply touched by your telegram. Greetings to officers and members and every success to your Convention.

ARTHUR HOTHERSALL
Woolwich Arsenal,
London, England

JOE BARRON, NATIONAL CONVENTION CHAIRMAN
143 Sidney Street
CAMBRIDGE, MASS.

FINANCIAL SECRETARY
Andrew W. Garrett
100 King Street
Dorchester, Mass.

◆

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29th ANNUAL CONVENTION

Awarded to

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JUNE 9-10-11-12

Plating Shop Economics

M. M. BECKWITH[1]
Read at Dayton Convention

DURING the last twenty years electroplating has made rapid strides in the advancement of the science and in the improvement of finishes. One needs only to look through the technical journals for this twenty year period to see the many improvements in the plating practices to realize that the field has established itself as a major industry. If space permitted, the author could go through a resumé of the new developments during this period, which would include the advent of chromium plating, commercial plating of alloy coatings, the introduction of bright nickel, and other bright metal plating. These subjects have been covered adequately in many good articles. Considerable has been written in regard to the difficulties met each time a new process in electroplating has been introduced. As time passes, these difficulties are usually ironed out.

Theory and practice have kept pace during this time. Any progressive foreman plater or manager of a plating department or plant specializing in electrofinishing realizes the necessity for maintaining a contact with his fellow-workers and with published literature. Much of the "magic" and "hokum" has been taken out of plating, thereby changing the field of plating from an art to a science. While this is not entirely the case, the trend is very pronounced. In view of the fact that the general essentials of plating practice and solutions have been covered adequately, this paper will not go into detail on that phase of the the subject.

I might say at this point that the Journal of this organization, namely, The Monthly Review of the American Electroplaters' Society, has had some exceptionally good articles during the past year on general operations in the plating room. I cannot emphasize too strongly the necessity for each of you men to go back over the last years's publications and reread many of those articles.

There is one phase of the field of production that has been discussed in the literature inadequately, namely, the economics of the plating room. At this present period of our country's history, it is probably more important than ever to be on the lookout for places to cut costs throughout the plant.

As one travels around the country from plant to plant, it is evident that each plant has some small contribution to make in this field of economy. It is surprising to note though how few of them actually put into practice many common operations that lead to a more economical production of work.

J. Haas([2]) in The Monthly Review has expressed very clearly and in detail a number of the suggestions that are made in this paper. There is one thing that many of you may disagree with, but upon giving it consideration you may find that it is true. That is, one of the most difficult things to do is to **THINK.** The best motto for anybody to adopt is **"Try Thinking!"** By thinking I mean reasoning and observation coupled together to arrive at a new conclusion. For example, this obviates taking for granted any operation throughout a plant.

Let us follow a piece of work as it is processed in the average job shop with special emphasis on operations relating to plating and finishing. By doing that I believe you can see the object of this paper.

Let us assume that the article to be processed is brought to this job shop owner or operator for bid. In making the bid on the contract, it is assumed that the volume of production is known and the piece is one that can be run in the cycle in operation in this plant at its present set up. The average job shop operation cycle includes the same as large plant production; namely, handling of incoming material, preparation of the metal in the polishing room, the processing of the metal in the plating department, the packaging and delivery of the finished product. The total cost of operating this plant for a given period of time is known by the calculation of labor and material costs. If the operator then knows the total amount of work processed in that same period of time, the average cost is then known. In other words, the usual method of obtaining the cost of finishing entails some base standard of comparison.

In determining the cost of plating an article, the square foot of plating area is, of course, the basis for calculation. The general practice seems to be in plating small articles in barrel plating units to discuss and determine costs on a basis of weight of a barrel load. For example, if a barrel will handle 100 pounds of steel articles, then regardless of the size of the article, many plants assume that 100 pounds of the articles will cost the same as any

100 pounds plated in that barrel unit. Possibly the article to be plated does not weigh 100 pounds per barrel load. In that case, the proportionate amount of the cost per 100 pounds is used as the figure. Let us take an example to show a fallacy in this method of calculation. Suppose that we are plating a steel cylinder ¼ inch round and 1 inch long—the surface area per thousand pieces is

DR. M. M. BECKWITH

6.13 square feet, those thousand pieces will weigh approximately 13 pounds, giving an area of .47 square foot per pound. Now let us take a steel cylinder ½ inch round and ½ inch long, giving an area of 13.6 square feet and a weight of 54.6 pounds, or .25 square feet per pound. It is obvious that every pound of the smaller cylinder has approximately twice the square feet exposed area as the large cylinder. Assuming that the law of voids is true, namely, that in any volume figured with spheres, the void space is constant

regardless of the size of the spheres, disregarding the effect of the walls, we can see that the total weight required to fill that barrel will remain substantially constant, but the total area to be plated is larger, the smaller the article. Therefore, it is possible in the case of these two cylinders to be 100% in error in calculating the cost of plating. This shows the necessity of reducing all cost data to square foot basis.

In most plants where there is a Cost Accounting Department, such as in the large manufacturing plants, the cost of processing per unit is known accurately. It is obvious that this particular type of accounting entails more work than is plausible for the average small plant or job shop. However, only a short time is required to calculate the approximate square foot area of the piece being considered, and that should always be done before attempting to bid. The break down of a cost account set up briefly is—items of cost of operation plus the standard profit figured. One listing of this break down might be as follows:

Cost of labor of the operation in the Polishing room per square foot area.

Cost of Labor in Plating room, per square foot area.

Cost of material in both departments, per square foot area, plus a cost figure called labor burden, which is frequently adopted as 150 per cent times the labor charge.

The total of these four items accounts for what is known as the standard cost of the article. In that standard cost, this charge noted as "labor burden" takes care of lost time in operation, the cost of maintaining a man on the job with respect to his particular share of that part of the factory overhead. To this standard cost figure is added an arbitrary figure determined for each plant that will take care of plant overhead, including office supervision expenses, that ranges all the way from 3 per cent of the standard cost to 25 per cent of the standard cost. To that is then added a figure which represents the cost of handling that piece into the plant and out of the plant. The sum of these then represents the manufacturing cost of the article. The profit that is to be derived is then added to the standard manufacturing cost. This profit percent is entirely up to the man operating the plant, ranging all the way from 50 percent to 100 percent.

At best the figure obtained in this manner is approximate, but if this type of cost figuring is followed an individual can very closely approximate the cost of operation. It is possible that the total of

all jobs in the shop shows a profit, but a study of each separate job will show that one or more is losing money. It would be well to either delete these jobs or extend the efforts to reduce their cost of processing.

One of the greatest sources of loss throughout any shop is that of wasted effort or lost motion during the many steps in operation. The path over which an operator travels determines the amount of energy he expends in accomplishing a given amount of work. By this I mean if he takes three extra steps per trip, it is obvious that his personal wasted effort is considerable at the end of an 8 hour shift. This brings us to the point of plant layout.

Many plants make an honest effort to study the layout of the plant with respect to straight line flow of production from the entry of the article into the plant to the final delivery station after processing, but at the same time overlook the tremendous saving to be realized in a proper layout of each individual operation. There are many plants that the author has been in recently where the movement of the rinse tank, or the movement of a plating tank, a distance of as little as 2 feet to make way for a new path for the operator, materially decreased lost motion.

The layout of tanks in a plating room is really never a fixed quantity. If an extra operator is put on the job, the layout that is satisfactory before he starts to work may require changes to accommodate this extra man. The cost of making these changes may usually be paid for in time saved and convenience of these operators in accomplishing their work. A change in finishing specification, such as thickness specification, or sequence of plates, may bring about a necessary change in plant layout. Most of these things are obvious, but unless they are studied regularly with each change in process steps, no matter how slight the change, the benefits that could be derived are lost.

If a plant is operating on the best working basis and the contract has been let, and it is found that an operator on piece-work can make considerably more wages by processing more than the standard, it is most unwise to reduce the standard of that job. The fact that the operator is able to make more money shows that either the estimate was wrong or he has improved his methods. If the estimate was wrong that can be taken care of on future estimates. If he has improved his methods, the man should benefit since the job was bid at an estimated cost, which has not been increased, since he is paid the fixed rate per piece.

With respect to buffing compositions, often the cheapest buffing composition in price, in reality, is the most expensive in cost. If a buffing composition is too difficult to remove, this entails more steps in subsequent processing. If a buffing composition is of an inferior grade, the work that stands in the plant between polishing and plating or painting may actually be chemically attacked by the material in the buffing composition. Also, the physical properties of a cheap composition may be such that actually more is required to accomplish a standard of quality than of a composition higher in price per pound. Therefore, a thorough study of buffing compositions and buffing wheels in any plant will possibly return dividends.

This can best be accomplished by setting aside your best operator and experimenting with buffing wheels and compositions with that one man using the same articles for each test. In large manufacturing plants, this is the customary practice.

Now let us follow the article into the plating room. The usual step is to put this material into some cleaner to remove the buffing composition. Many plants do not furnish gloves for the handling of work to be processed because they view gloves as an unjustified item of expense. One of the greatest sources of trouble is not in the removal of the buffing composition in itself, but the removal of a smeared buffing composition and finger marks. In most cases, gloves will pay for themselves and more, too, in reduced cost of processing. The selection of the proper gloves for the job is important. Rubber gloves are often cheaper from the operation standpoint even though the initial cost is higher.

This work is then put on racks—and this point is one that bears a great deal of investigation. W. L. Pinner[3] has listed a brief discussion of racking with respect to distribution of current density. A study of proper racking will decrease rejects, increase the ease of plating to specifications, and decrease the amount of wasted nickel by overplating on some sections of the article while meeting specifications at the point of minimum plating thickness.

The practice in general is to insulate the racks by some coating. There are many of these types of coatings on the market at the present time and each one is best suited for a certain cycle of operation. It would be well to investigate these from the standpoint of their ability to withstand the cycle of operations with which they are to be used.

Many plants use short contact wires attached to the stem of the

rack. Most of the rack coating material will crack if bent or stretched too much. The longer the finger contact attached to the spine of the rack, the less bending at the spine, therefore the longer period the coating should prove satisfactory in use, considering only failure at the stem of the rack.

In the case of racking problems, it is desirable to have as uniform a set of racks as possible. One source of expense is in the size of the stem. Many plants do not calculate the standard carrying capacity in the stem. If they did, they would find that a rack is built for a capacity many times the maximum ever to be used. As copper is expensive, a saving in racking material is a direct saving in a plant. One square inch of cross section of copper will carry 1000 amps. of current efficiently as a bus bar and 2000 amps. as a rack. Any larger area is wasted material from a standpoint of electrical efficiency.

Suppose, for example, a plating room has a set of 200 racks constructed of copper weighing a total of 2000 pounds. Let us assume, from a current efficiency standpoint, that we could reduce the weight of copper in those racks by one-half. At 20 cents per pound for copper rack material, it is obvious that we could save $200.

This saving is not only made at the time the racks are constructed, but the loss of material on the disposition of old racks is lessened. Along with this discussion it might be stated that there is a lower limit, naturally, for the size of the rack stem for stability and strength than would be dictated by electrical efficiency. It is to be noted that usually any rack strong enough will be in excess of the minimum cross section for the efficient transfer of current. It is possible to use a stem of steel to which the hook and fingers of copper could be brazed. The current efficiency of iron is approximately one-seventh that of copper.

Another source of possible savings in the plating room is in the efficient application of rinsing. J. D. Tierney([4]) discusses in detail the use of spray rinsing throughout the plating room. Included are two figures showing the efficient use of a spray rinse tank. The savings possible with the use of spray rinses are real and not imaginary. Inasmuch as these savings are listed and discussed at length, I will merely mention the most important ones.

1. Cleanliness of the surface is improved because there is no contamination picked up from a spray rinse as would be done in removing the work from a still type rinse, where contamination is floating on top of the rinse water.

2. The lessening of water use.
3. Fewer number of rinse tanks required.
4. The reduction of the cost of disposal of the refuse water where this is an item.

In many cases one spray rinse tank on a hand operated line can be used to supplant three or four still rinses. It is a fact that the still rinses must be run continuously whereas we have the possibility of running a spray water rinse intermittently by use of a foot valve or a bar connection to a quick-opening valve, such bar extending entirely around the tank.

Besides these advantages listed, it is entirely possible that a saving of steps could be effected with proper use of spray rinsing on a hand operated plating line. Let us take an example of an operation which is carried out at the rate of 4 trips per minute through the cleaning, rinsing, acid dipping, copper plating, and nickel plating. Suppose that we could save 4 steps per trip, conservatively saving 2 seconds per trip. At an average hourly rate of 60 cents, this would mean 8 seconds per minute or 64 minutes per 8 hour day, involving a saving of 64 cents per one man a day or $160 per one man a year. While it might not be possible to accomplish this particular total saving, at least part of it may be realized at the same time the lost effort on the part of the operator is reduced, and, as an individual he realizes a saving in energy.

As far as water saving is concerned, suppose that we have three still rinses operated at open valve continually for 8 hours. With a 30 pound pressure on a half inch line, they will use 7200 gallons of water, which, at a cost of 10 cents per 1000 gallons, will amount to 72 cents.

Now let us suppose that we install a spray rinse, which is operating at open valve 30 seconds out of each minute, to take the place of the three still type rinses. At the end of one day that single spray rinse tank will have used 1200 gallons of water, which at 10 cents per 1000 gallons amounts to 12 cents. This, you can see is a considerable saving, which at the end of a year would amount to $150.

At the exit end of the nickel tank is another opportunity to use spray rinsing. If a set of nozzles are installed here, the water required for addition to take care of evaporation can be used efficiently to spray the nickel solution from the work. This would materially decrease drag-out. I know of one full automatic tank that was losing approximately $12 per day drag-out of nickel

solution valued at 50 cents per gallon. The addition of spray rinsing facilities, as described above, reduced this drag-out loss to less than 50 cents per day. These sprays are intermittent in action, being run by a Solenoid valve installed on the equipment so as to be coordinated with the removal of a rack from the solution. A small plant may realize as much as $3 per day by using this type of installation.

Intermittent spraying nozzles can be applied to the exit end of the tanks containing copper plating solutions, especially the new Hi-Speed copper which operates at a temperature of approximately 170°. Spray rinsing the work being removed from the bath is most useful, to realize a saving in solution drag-out.

One of the most important considerations in a plating room is the generator. L. L. Soffell[5], in The Monthly Review, discusses extensively the sources of troubles and their solutions. He points out that the generator must be kept clean. The cost of a partition between the plating tanks and the generator is minor compared with the effect on generators of contamination by plating solutions. Such a partition could be easily built with wood at a very reasonable cost.

It is desirable to have some type of auxiliary tank available for experimental use. Such a tank to be easily moved to any point in the sequence of operations so that it could be submitted for the stationary tank for test purposes. I have in mind the experimenting with a new cleaner, with a new type nickel solution, or trouble shooting for difficulties throughout the line in order to improve production. If this small tank were portable, then a change in the sequence could be made with a minimum loss of time and also without throwing away the materials in the tank line-up proper before they have been proved to be the source of trouble. This would enable one to locate more quickly the trouble in a sequence of plating operations. For example, the first cleaner could be changed by using the auxiliary tank outside of the line. If the trouble persisted, then the tank could be moved to the second cleaner, if such existed, using the regular first cleaner in the line and substituting a new product for the second cleaner in the auxiliary tank. If this still did not prove to be the source of the trouble, the rinse tank could be substituted, or the acid dip, or some nickel solution put into the auxiliary tank and by-passing the regular nickel tank with the work. In other words, it is pos-

sible by the use of an auxiliary tank, even though it is small, to logically search for the source of trouble.

There is one thing that is very rarely mentioned in the smaller plants, but is continually discussed in the large plants and that is Safety and Good Housekeeping. By Good Housekeeping we mean a clean plant with excess dirts and materials kept free from the floor, and all processing materials kept in their places. This may appear to be a state almost impossible of attainment, and it is one that requires perseverance of effort.

It is true that if operators are clean with the plant and their surroundings, they will be clean with the work they are processing. Slovenliness with respect to their surroundings very frequently extends to slovenliness in their work.

The question of safety is one that cannot be emphasized too much. One small accident may cost more than can be saved in all labor and time saving devices installed in a plant. The question of safety in the plating room involves slippery floors, poor electrical connections, poorly ventilated tanks, and many numerous apparently insignificant sources of trouble. It is most important that one have First Aid material on hand and force operators to use bandages or First Aid no matter how slight the injury. It is surprising how many serious effects come from ever so small injuries, including minor scratches. A diligent application of Safety, First Aid, and Good Housekeeping pays big dividends.

In summary—let us say that in order to accomplish savings in a plating plant, it is necessary to apply a thorough course of study to all the processing operations. This cannot be done by a cursory glance through the plant, nor can it be done by reading of the published articles on any type of solutions or trouble shooting. Diligent effort must be put forth continually to accomplish results. Changes that one may make today may be obsolete in a month. Those who are operating shops where the jobs change regularly should be even more diligent in the pursuit of economics in the plating room. There is one motto that could well be adopted by all of us and used daily, and that is—**TRY THINKING!**

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[1]M. M. Beckwith, Development Engineer, The J. B. Ford Sales Company, Wyandotte, Mich.
[2]J. Haas, The Monthly Review, 349, May 1939.
[3]W. L. Pinner, The Monthly Review, 615, August 1939.
[4]J. D. Tierney, The Monthly Review, 937, December 1939.
[5]L. L. Soffell, The Monthly Review, 27, January 1939.

GOOD NEWS FROM MR. BARROWS

628 Dovercourt Road,
Toronto, 4, Ontario,
June 23rd, 1940.

Mr. W. J. R. Kennedy,
93 Oak Grove Avenue,
Springfield, Mass.,
U. S. A.

Dear Mr. Kennedy:

The beautiful flowers which were delivered to my hospital room last Saturday did indeed deeply touch me. They filled my room like a conservatory and were a bower of loveliness.

Will you please accept for yourself and convey to all my friends of the A.E.S. 1940 Convention my grateful appreciation. Words are poor tools with which to express oneself so I find it difficult to adequately say "Thank you."

I am now at home—and the flowers came with me to brighten my sickroom. With the coming of warmer, sunnier days I do hope that I'll regain strength and be able once again to take my place with my Plater friends.

Again many many thanks,

Most sincerely yours,
WALTER S. BARROWS

A LETTER OF APPRECIATION

Mr. W. J. R. Kennedy,
93 Oak Grove Avenue,
Springfield, Mass.

Dear Sir:-

At the February meeting of the Cincinnati Branch, American Electroplaters' Society, Joseph Adler, Owen T. Towner, and Harry Misner were appointed as a committee to solicit articles with the help of our members in general from their respective firms for the display at the Convention just closed.

As the result of the generous cooperation of members and their firms toward such a display, the Cincinnati Branch is today the permanent possessor of the cup, the prize for the display with the highest merits and awarded by the awards committee of the Convention.

The Cincinnati Branch is indeed proud of this cup and wishes to extend its thanks to the above committee for the splendid way in which they handled the Cincinnati Exhibit. Special mention is due Mr. Owen T. Towner for the larger share contributed in the various forms of effort toward making the branch display the success that it was.

The Branch also wishes to thank the following firms for the loan of the articles used in the Cincinnati Plated Ware Exhibit: The Mosler Safe Co., Hamilton, Ohio; Metalcraft Mfg. Co., Cincinnati, Ohio; Auto Sun Products Co., Cincinnati, Ohio; Cincinnati Plating & Repair Co., Cincinnati, Ohio; The Fox Co., Cincinnati, Ohio; Max Wocher Company, Cincinnati, Ohio; Batesville Casket Co., Batesville, Indiana; National Metal Products Co., Connersville, Indiana; The J. B. Schroder Company, Cincinnati, Ohio.

MR. McCORD ATTENDS THE CONVENTION

The use of pre-prints of papers to be delivered at conventions is, of course, old in other societies but the Dayton Branch gained the honor of first introducing them in ours.

We watched the innovation with a good deal of interest. Not all of the papers were printed in advance but each registrant was handed copies of nearly all of them when he registered.

As we view it, pre-prints have two possible advantages. Where large amounts of figures are involved, and the audience already have those figures in their

possession, the speaker is in a position to point out significant facts and conclusions much more rapidly and without the detail that is necessary when the reverse is true. That is a relief both to the speaker and the audience.

However, the main advantage of pre-prints is to facilitate intelligent discussion after the paper is presented. If the pre-prints are not read in advance, this object is not attained, and the cost of printing and distributing them is hardly justified. All members are eventually furnished with complete records of all meetings, including the papers, so that the additional cost of printing in advance would hardly be warranted unless the discussion really was helped by so doing.

We waited with bated breath to see whether we could determine the extent to which the papers had been read. Perhaps we underestimate the quick wits of our membership, but we came to the conclusion that they had been pretty widely read. We noted that a good many individuals went to the platform and read questions couched in rather careful language and all written out. Perhaps they wrote those questions during the course of the presentation, but our guess is that they came to the meeting with the questions in their pockets. If that is true, the cost of printing would seem worth while and we commend the practice to other conventions.

Besides, it does furnish copies of the papers to registrants who are not members of the Society and also makes good reading matter on the way home for members of the Society who somehow failed to hear them when presented.

W. W. McCORD
Associate Editor of the REVIEW.

MR. HAGUE WRITES US

Mr. W. J. R. Kennedy, Executive Secretary
American Electroplaters' Society
93 Oak Grove Avenue
Springfield, Massachusetts

Dear Mr. Kennedy:

Thank you very much for your kind letter of June 18, and you may be certain that we are most desirous of cooperating with the American Electroplaters' Society at all times.

The opinion of the writer, and all of us from our company who were present at the convention, was that you put on a splendid educational session and that the arrangements were very satisfactory.

Kindest personal regards.

Very truly yours,
HANSON-VAN WINKLE-MUNNING COMPANY
LOUIS M. HAGUE, *Vice-President*

THANKS FROM MR. GRAHAM

Mr. W. J. R. Kennedy,
93 Oak Grove Ave.,
Springfield, Mass.

Dear Mr. Kennedy:-

Thank you very much for your kind letter of July 8, relative to the gold medal award which was awarded to me.

I have received the medal and want to take this opportunity of thanking the Society for the honor which I feel is to be shared with the other two authors.

I also greatly appreciate your interest in my recovery and I am glad to say that I am now feeling quite well. It was indeed a hardship not to attend the Dayton Convention which I understand was very successful.

With kind personal regards, I am

Sincerely yours,
A. KENNETH GRAHAM

MR. PROCTOR SENDS HIS CHECK FOR $100.00

Mr. Carl Zapffe
Battle Memorial
Columbus, Ohio.

Dear Sir:

I have been advised by Mr. W. J. R. Kennedy, Executive Secretary of the American Electroplaters' Society and Editor of the Monthly Review, that you have been declared winner of the Herminie Dorothea Proctor Award for the best paper presented at the 28th Annual Convention held in Dayton, Ohio, June 10-14. As the Founder of the American Electroplaters' Society, I extend to you my congratulations. I feel sure that your paper will be greatly appreciated by the members of the American Electroplaters' Society who will look forward to other papers from your pen and become an incentive for the writing of other instructive papers by its membership.

I enclose my certified check for One Hundred Dollars in payment of the award.

Very Sincerely Yours,
CHARLES H. PROCTOR

MR. ANDERSON ACKNOWLEDGES RECEIPT OF CHECK FOR THE BEST PAPER PRESENTED IN THE REVIEW LAST YEAR

Mr. W. J. R. Kennedy,
Executive Secretary,
American Electroplaters' Society
93 Oak Grove Avenue,

Dear Mr. Kennedy:

Mr. Reinhard and I wish to thank you and the Award Committee for the honor which you have given us. While the financial reward is truly appreciated, we both feel that the honor is truly to be esteemed.

With best personal wishes,

Very truly yours,
E. A. ANDERSON
for RESEARCH DIVISION

A LETTER FROM PAST PRESIDENT GOODSELL

There are times when it is difficult to find words for the proper expression of one's sentiments. My chief feeling today is one of relief that the year's work is ended.

I have enjoyed my term of office and the many pleasant occasions we have had together. Taken as a whole, the year has been a success, but I realize that this would not have been possible by my efforts alone. I have had your good will and earnest cooperation at all times and for this I am truly grateful. I have endeavored to serve you well. Where I have succeeded you have been generous in your praise; and where I have failed, you have been charitable and sympathetic. Because of these things my term of office will be long remembered as a most pleasant period of my life.

I am grateful to you all and if in the future I can serve you, individually or collectively, please do not hesitate to call on me, for I shall be happy to respond.

R. M. GOODSELL, *Past President*

Harold Mahoney

On June fifth, Detroit Branch A.E.S. lost one of its popular members when Harold Mahoney passed away. His sudden demise after such a brief illness was a shock to all his friends. For the past 15 years Harold had been a partner with his father Richard C., and brother Lawrence, in the plating firm of R. C. Mahoney Company, located at 1540 Anna Place. Born in Detroit 43 years ago, Harold has lived here all his life, and had made many friends both in and outside the plating trade as he had been employed for 10 years by the Detroit Edison Company previous to joining his father and brother in business.

NEW HOSE TYPE INSULATING STEAM JOINT

A new type of insulating steam joint has been developed by the Hanson-Van Winkle-Munning Company, Matawan, N. J., manuafcturers of electroplating equipment and supplies. This joint, called the "Hose Type", consists of a special seamless rubber tube, compounded to resist steam and heat and covered with plies of strong, closely woven duck. Between these plies are placed layers of insulating rubber. A heavy gauge cover is applied on the outside.

Each joint is 8″ long and built to stand 100 pounds steam pressure. It is furnished complete with hose clamp on each end for attaching to standard size iron pipe. The joints are inexpensive, easily attached and replaced, and fully adequate for all of the normal conditions of acid and other chemical handling equipment.

NEW BULLETIN ON DIPPING BASKETS

Dipping baskets. Bulletin D-104 published by the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies. A complete line of wire baskets in various meshes and gauges, made of steel, brass, aluminum, Monel and nickel-chromium. Steel baskets are built in specially welded construction to increase strength and length of life; no loose wires, loose ends, etc. Also glazed earthenware and sheet metal baskets.

IMPORTANT ANNOUNCEMENT REGARDING MEMBERSHIP

The membership lists have not been checked with the branches for several years and a preliminary check shows several discrepancies between the records of the branches and the Supreme Society. Mr. Kennedy has written each branch for an up-to-date membership list and every Secretary is requested to return his lists as soon as possible.

Starting with this month, a chart will be included in each REVIEW showing the progress of the membership campaign of each branch. A prize will be awarded at the Boston Convention to the Branch showing the greatest increase for the fiscal year. Complete details of the contest and a picture of the prize will be published in the August issue of the MONTHLY REVIEW.

Elects, transfers, suspensions, resignations and deaths, and all percentages, will be calculated on the membership of the Branch at the beginning of the fiscal year, May 1st, 1940. If in checking the membership lists between the Supreme Society and the Branch Secretaries, discrepancies are found which existed at the beginning of the fiscal year, these changes will be made immediately.

Every Branch Secretary has been requested to send the name and address of the Branch Membership Chairman to the Chairman of the Membership Committee so that full details of the contest can be sent to the proper persons. Close cooperation will be maintained between the Branch Membership Chairman and the Vice-President in charge of Membership.

Several branches suspended the inactive members from their rosters last year and thus with all active members on their rosters there should be very little need of suspending members, thereby making it easier to increase the membership of the Society as a whole.

The goal for the fiscal year, 1940 to 1941, should be 2600 members.

ELLSWORTH T. CANDEE,
1st VICE-PRESIDENT

Here and There

To those who are not too familiar with New England history the figure in the background on the new stickers advertising the Boston Convention is none other than Captain John Parker, one of the Minute Men who fought for the liberty we now enjoy.

"The Minute Men" was the name given to the volunteer soldiers of New England in the American Revolution who were pledged to take up arms on a minute's notice. An act of the Provisional Congress, passed in 1774, authorized the enrollment of such members as a military force, and a considerable number of them took part in the Battle of Lexington, the first engagement of the war. The scene of this battle is one of the shrines that may be visited by those attending next year's convention.

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We are pleased to adopt the suggestion offered by a prominent member of one of our midwestern branches that a picture of the American flag with the oath of allegiance be published in the REVIEW each month. Both the flag and the oath appear in this month's issue on the title page.

While we realize that true patriotism goes deeper than displaying the flag and repeating the oath, we are proud to make the claim that no other organization is any more loyal to the lofty ideals symbolized by the Stars and Stripes, and no body of men would more quickly subscribe to the oath of allegiance than the members of the American Electroplaters' Society.

*****

President Fulforth hopes to have the Paper Awards and Exhibits Award Chairmen make their reports at the final business session of next year's convention, so that there will be no misunderstanding or confusion as to who were the winners. It is hoped also that the medals, checks, and certificates will be presented at the closing session of the convention, with the prize winners present in person. We are heartily in favor of this idea.

In this connection we wish to correct a statement made in last month's REVIEW. The award of the Samuel Heunerfauth cup to New York Branch is correct. The cup was presented to this branch for the paper "The Effect of Certain Wetting Agents Upon Nickel Deposits" read by Dr. C. B. F. Young at the Asbury Park Convention last year.

*****

We cannot be too lavish in our praise of the members of the various branches who gave unselfishly of their time and talent in contributing to the success of the exhibits. The foundation laid last year at Asbury Park was responsible in a great measure for this year's remarkable display of plated articles.

*****

One of the things overlooked on many occasions is the splendid service rendered by the Chamber of Commerce in the cities entertaining the Convention. Dayton was no exception in this respect and Boston is enlisting the Chamber's help in advertising next year's meetings. In addition to this, they give their services free in many ways that are greatly appreciated by the Committee Charimen.

*****

The officers in charge of the Convention details are grateful for the fine cooperative spirit shown by the various committees appointed, such as the awards, auditing, resolutions, etc. The work of these committees requires patience, courage and diplomacy and is often the object of severe criticism. It is a tribute to these men to say that we have heard no criticism from anyone attending this year's convention regarding the decisions made by the committees. Their willingness to serve is also worthy of notice.

* * * * *

Perhaps we should give more publicity to men whose names seldom appear in our columns. In this connection may we pay tribute to St. Louis Branch for the

fine delegation that came from their city. Ed. Musick, everyone knows. He is one of our energetic past Supreme Presidents. Bert Daw, President of Lasalco, Inc., is also a familiar figure at our meetings and Conventions. Then there is Charles T. McGinley, who was appointed a member of this year's auditing committee. Joseph Humefrecht, President of St. Louis Branch, Joseph Vogt and others, including several good looking young ladies, who seemed to enjoy every minute of their stay in Dayton.

* * * * *

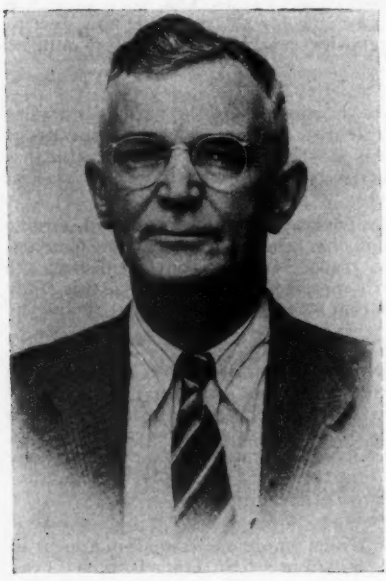
Our good friend, the Associate Editor of the REVIEW, Mr. W. W. McCord, came from Detroit for a short visit. In another column he gives us his ideas of the preprints of papers. We were glad to have a few hours chat with Mr. McCord who has written some very fine editorials in the REVIEW and has helped consistently in many ways during the past year.

* * * * *

While on the subject of preprints, our membership might be interested to know that 19 lots of 600 preprints each, or 11,400 copies cost, for printing and transportation charges, a total of $478.81. We mention this item particularly because in some instances where preprints were given there was a tendency to leave them lying around carelessly.

* * * * *

Mr. William Belke, President of Belke Manufacturing Company, Chicago, was taken seriously ill upon arriving in Dayton to attend the Convention. Replying to a letter of sympathy sent to him, dated June 22, Mr. Belke says "I am feeling much better now, going to work every day. I was sorry that I could not get around to the Convention as I had looked forward to it for a whole year. To miss everything at the last moment and have this occur at the critical time was very disappointing to me." Mr. Belke's many friends in the A.E.S. will be pleased to learn of his recovery.



ANDREW W. GARRETT

Secretary-Treasurer of Boston Branch since June 4, 1920, at which time the Branch was organized at the old Adams House.

GERALD A. LUX

Gerald A. Lux, newly appointed Research Associate on the A.E.S. Research Project at the National Bureau of Standards has been an associate member of the Rochester Branch, A.E.S., since 1928. "Gerry," as the Rochester A.E.S. members call him, conducted the Rochester Branch School and has been active in their educational and social acitivities.

He received his B. S. in Chemical Engineering from the University of Rochester in 1927. Shortly afterwards he was engaged by the General Railway Signal Company to install a chemical laboratory in their plant to apply laboratory control to their plating, cleaning, organic-finishing and foundry operations. He remained with this Company twelve years gradually expanding the activities of his section to cover raw materials and finishing selection, specification and acceptance testing. In 1939 "Gerry" accepted the offer of the Lustre Chemical Corporation to become its Technical Director. In this position he was responsible for formulation and manufacturing control of cleaners and technical advice in sales and application of metal cleaners, plating supplies and heavy chemicals. He left this position to become the A.E.S. Research Associate.

"Gerry" is a past chairman of the Rochester Chapter of the American Society for Metals; a member of the Executive Committee of the Rochester Section of the American Chemical Society, and also a member of the American Society for Testing Materials, The Electrochemical Society and the Rochester Engineering Society. He was awarded his New York State Professional Engineer's License in 1936.

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Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTROPLATERS' SOCIETY

Toledo Branch of the A.E.S. held its regular monthly meeting on Tuesday, April 30, in room 224 of the Macombeer Vocational High School, Toledo, Ohio.

The following questions were found in the question box and discussed:

Q. I would like to know about the throwing power of bright Ni. Sol. and if the parts plated has any effect upon same, especially if the parts are small brass screw machine parts?

A. The throwing power of Bright Ni. is about the same as in the Watts bath. Some bright Ni. baths have better throwing power at temperature of 130° F. Contamination of bright Ni. Sol., by very small amounts lead, copper, iron, and rubber cuts down the throwing power and affects the brightness. The thickness of deposits will vary some on irregular shaped parts in either bath. The only way to overcome that is proper rack design, which was discussed at length.

Q. What does the iron in a hard chrome bath do in relation to the deposit and how much, if any, should be present in sol.?

A. Up to a certain point, iron hardens Chrome plate. It is best to keep your iron content as low as possbile as the presence of iron increases the resistance.

Q. Has blistering on die cast plated parts been found to be due to overcleaning, or absorption of copper by the zinc, and what can be done to eliminate it?

A. Overcleaning. If using a strong cleaner, time should be cut and stronger acid dips used. .0002 maximum amount of Cu that Zn. can absorb.

Q. Does slow speed ball burnishing do as good job as high speed, say one 14 r. p. m., another 30 r. p. m. on steel?

A. Slow speed is better than high speed. Some run as low as 10 r. p. m. Produces more rubbing. Speed must be ascertained by experiment.

Q. Which way does current flow in a plating solution?

A. From Anode to Cathode.

Q. What is the matter with a bright Ni. deposit when it peels on chrome plating..

A. Oxidation, contaminated rinse water, stress in Cu plating due to low pH, or soaps not rinsed off properly after cleaning, Ni then deposits over this film and peels or blisters when Cr. plated due to the high stress in chrome plating.

GASTON BERGEMAN, *Secy.*

Los Angeles Branch held its regular monthly meeting at the Rosslyn Hotel.

Mr. Holman introduced Mr. J. B. Eberhart, of Columbia Steel, speaker of the evening. After a few words, Mr. Eberhart commenced the showing of a moving picture, "Making and Shaping of Steel," produced by U. S. Steel. At the conclusion of the picture, the members agreed that they had seldom had the pleasure of witnessing a more interesting or educational film. Mr. Eberhart offered to refer any questions to the technical department of his company for complete answers.

The question box contained the following questions:

Q. How can stainless steel be bright pickled?

A. Question referred to technical department of Columbia Steel.

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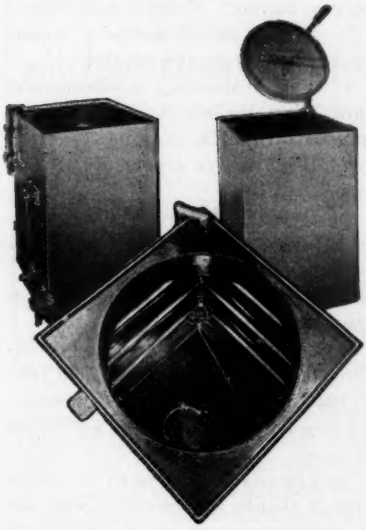

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STORTS WELDING COMPANY

42 STONE STREET — MERIDEN, CONNECTICUT

Manufacturers of Welded Fabrications to Specification

Q. Is it possible to strip hard chrome from stainless steel without pitting?

A. Try caustic strip with reverse current.

Q. How can Ni. be stripped from die cast without injuring surface of diecasting?

A. Strip in H_2SO_4 with just enough water so that current will pass. 6 volts. Reverse current. Room temperature.

Q. What is the best method of recovering Ag from Ag plating solution?

A. Put Zn shavings in solution and allow Zn to displace Ag. Separate Ag from Zn with HCL.

Q. What causes bronze plated diecastings to blister?

A. Over cleaning. Try a heavy deposit from a Rochelle Cu sol. Then bronze.

Mr. C. L. Savage was admitted as an active member.

It was voted that the Social Committee organize a picnic to be held July 28, 1940. The committee was authorized to spend not more than $20.00 on the picnic.

The Librarian was ordered to send a letter of thanks to Columbia Steel for the excellent picture which was shown at this meeting through their courtesy.

ERVIN E. FRAUENHOFF, *Secy.*

Bridgeport Branch held its regular monthly meeting Thursday, June 6, at 8:00 P. M. at the Stratfield Hotel with President John E. Charleson presiding. There were 22 members present. The Roll Call of Officers was read and all were present. The minutes of the previous meeting were read and accepted.

Mr. R. J. O'Connor, Chairman of the Membership Committee, reports good news of many new members for the coming year. Attention was called for good work done by the following members during the past three years: Mr. William A. Ehrencrona, Mr. R. J. O'Connor, Mr. Clarence C. Helmle, Mr. Joseph G. Sterling, Mr. Charles McElroy, Mr. Elmer Monson, Mr. Fred Gotthardt, Mr. John E. Charleson. Credit also must be given to other members of our Branch who have helped and are helping to get more new qualified applicants and members. Joe Sterling is glad to help any members who wish literature which sometimes is necessary to get new members under the A.E.S. wing.

Mr. Eugene Phillips, Chairman of the Sick Committee reports that sympathy and condolences were offered in the memory of Mr. Otto Edward Meyer, father of our member Dr. Walter R. Meyer, and that sympathy and condolences were offered in the memory of Mrs. Alma Ehrencrona, mother of our member Mr. Wm. A. Ehrencrona.

No meetings are to be held in July or

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August. Dr. Walter R. Meyer suggested an outing to be held sometime early in September. This was acted upon and President John E. Charleson appointed the following to the Outing Committee: Joseph G. Sterling, Chairman; Wm. A. Ehrencrona; Charles E. McElroy; George J. Karl; Fred Gotthardt.

Treasurer's report was read and accepted.

President John E. Charleson turned the meeting over to our Librarian Clarence C. Helmle who is in charge of our Educational Sessions. The topic was "Barrel Plating" and much discussion was held on this subject, all in good fun. Chrome Plating also was discussed with a lot of members giving their views on the subject of using different and various radicals in their chrome plating solutions.

Our members like to hear finishing discussions so we will continue with this type of program which are Educational. Dr. Meyer and Mr. Helmle assist us greatly in our efforts to have interesting meetings.

JOSEPH G. STERLING, *Secy.-Treas.*

Detroit Branch meeting of June 7, 1940. QUESTION BOX:

Q. It is generally recognized that high current density areas on irregular shaped articles are the points of thickest deposit. In the case of nickel, why is it that when stripping such articles with reverse current, the deposit is removed first from the low current density areas?

A. Polarization of the high current density areas in the stripping solution is probably the cause for this phenomenon. If we assume that the strip acts equally fast on high and low current density areas, then the points of thin deposit will be stripped first. If high current densities are used in stripping, the polarization on high current density areas may be very great and appreciably retard stripping at these points.

Q. What is the chemical used for reducing or overcoming fumes in a copper cyanide solution?

A. No specific chemical was known which has this particular function. By regulating the copper and free cyanide contents in proper balance, the efficiency can be kept at as high a value as possible which will appreciably reduce gassing. Maintaining the pH at the proper value with caustic soda will decrease cyanide fumes to a certain extent. The use of Rochelle salt in retarding the decomposition of the sodium cyanide will have the same effect.

Q. What effect does agitation have on current distribution?

A. Agitation tends to decrease the normal polarization on high current

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density areas and thus has a harmful effect on current distribution.

Q. Is there a tendency for a bright nickel deposit to laminate when plated from a barrel?

A. Yes, but this tendency may be no greater than in the case of a dull nickel deposit, depending on the nature of the bright nickel solution.

Q. Can bright nickel be plated directly on steel in the barrel process?

A. A member stated that he was doing this every day in his shop, using a proprietary bright nickel plating solution and obtaining satisfactory deposits over .0005" thick.

Q. What is the method used by the Bureau of Standards to plate standard panels with a known thickness of chromium in order to test the accuracy of the drop test for determining chromium thickness?

A. Dr. Blum stated that the same general procedure was used for plating panels in chromium as with other metals. Briefly, a series of plates are hung close together making in effect one large plate which is closely boxed in by a non-conducting tank. Some heavy plate occurs on the edges of the panels, otherwise the deposit is uniform within five percent. Spot tests are made on each panel and the chromium thickness is then determined chemically to check the results.

R. B. SALTONSTALL, *Librarian*

Newark Branch held its regular meeting on Friday evening, June 21, 1940. The meeting was called to order at 8:30 P. M. with President William T. Maguire presiding. All officers were present except our Vice-President, William Bruhns.

After the roll call of officers the president requested a roll call of members to comply with the resolution which was voted on and carried at our previous meeting.

The minutes of the previous meeting were read and approved.

A notice was read from Lancaster Branch with reference to the change of their meeting place and also announcing their Annual Social and Picnic scheduled for August 10, 1940.

Horace Smith gave a brief resume of the Dayton Convention. Mr. Wagner announced the names of the Newark Members who attended the convention: Horace Smith, George Wagner, Nelson Sievering, George B. Hogaboom, Fred Gumm, Robert Sizelove, Chris Kuell, William T. Maguire, Louis Donroe, Van Winkle Todd, Harmon Hunt, A. P. Munning and Urban A. Mullin. He further stated that the Ladies Auxiliary of Newark Branch was also represented by five of its ladies. Mr. Maguire, Mr.

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Donroe, Mr. Mullin, Mr. Hunt and Mr. Kuell made a report on papers which were read and discussed at the convention.

The chair appointed an Educational Committee naming Louis Donroe, our Librarian, as Chairman and Paul Oldam, Robert Sizelove, and George Reuter as his assistants.

Our Librarian presented the guest speaker of the evening, our good friend and fellow member, George Reuter who conducted a question box, excerpts from which follow. Mr. Reuter was given a rising vote of thanks for his interesting answers.

Q. What causes the pH of a nickel solution made up of single and double nickel salt, sodium chloride and boric acid to rise?

A. Too large an anode area or too low in boric acid.

Q. How high can the pH of a nickel solution be raised with nickel carbonate?

A. Old nickel carbonate will raise it to pH 6.0, freshly precipitated nickel carbonate will raise it to pH 6.4, and freshly precipitated hydroxide will raise it to pH 6.9, all electrometric readings.

Q. How much Boric Acid will dissolve in a Nickel solution at room temperature?

A. A member stated that he was only able to dissolve 4 ounces of boric acid to 1 gallon of Nickel solution at 70 per cent but after adding sodium sulphate to the nickel solution he was able to get 9 ounces of boric acid into the solution per gallon.

Q. How high an iron content is recommended for nickel plating solution? Are there any bad effects due to too high an iron concentration in the baths?

A. In the high chloride bath, high purity nickel anodes are recommended Iron concentrations above 5 grams per liter will have a bad effect on nickel plating solutions.

Q. Can you put too much Boric acid in a nickel solution? If so, what damage does it do? How can you test for boric acid?

A. Yes, you can use too much Boric acid if you use too high a Metal content in a hot solution. This may cause cracking, but in a cold solution no danger is experienced. Determination may be made by using Methyl Red in glycerine using NaOH as a titrator.

Q. What composition of a brass solution would be best to use for strip steel? Time in bath 25 seconds.

A. Reverse current sodium nitrate solution for stripping nickel from steel.

Concentration — 3 lb. to gal. 360 g = L

Higher concentration permit

Higher current density

Temperature 200° F-100 Amp. sq. ft.

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3.7—5.3 (zinc)	9.2—11.0
1.9—3.4 (copper, nickel)	(brass, copper.
0.9—1.5 (copper, etc.)	silver)
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Nickel and copper precipitate

To keep effective should be kept neutral by adding nitric acid.

The acid colorless to phenolphthalein. Alkaline yellow to methyl red.

Q. Do carbonates interfere with cyanide determination in analyzing for free cyanide?

A. We found that carbonates was the interfering agent, and that according to the amount of carbonates present in the solution, so the error varied. We then set upon a method which gave consistent results all through the run. These runs were made every forty-eight hours, extending over nine months, and 6 analyses were made every forty-eight hours, so that our cyanide determinations were quite numerous. We took 10 c. c. samples of the solution, put them in beakers, diluted them with distilled water. Then we estimated the carbonate content using barium nitrate. The nitrate was used because we were subsequently intending to use nitrate of silver and there would be no interfering salts added. We found the amount of carbonates in the solution, and found the amount of barium nitrate that was necessary to precipitate those carbonates, then we added that quantity of barium nitrate to the other sample, filtered and washed with distilled water, and then titrated it. We could duplicate results, and would get within an experimental error of the third decimal point. We used that all through, and we found that that was a reliable method and that zinc did not interfere as Clennell had stated. We tried copper sulphate and tried copper nitrate. Neither of those gave us any results.

Our Librarian announced that he was endeavoring to set up a program which will be appreciated by all of the members. Return post cards in the form of a questionaire will be mailed to each member with the request that they check the subjects of most interest to themselves. He will then endeavor to secure speakers who possess the most knowledge regarding those subjects.

Bob Sizelove exhibited a part of a fixture-base metal die cast which was brass plated, oxidized and lacquered with a baking lacquer. The oxidized finish had peeled off on quite a large area and he asked if any of the members knew the cause for this condition. After

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considerable discussion, the majority agreed that this condition was mostly caused by the oxidize solution being too strong and that a good remedy would be a weaker oxidize solution, running the article two or three times through the oxidize and sour water, using a water rinse-off between each dip.

GEORGE WAGNER, *Secy.*

Rochester Branch held its regular monthly meeting on Friday night, June 21. President Sylvester P. Gartland was in the chair. Regular business was transacted during which five new members were elected.

The delegates to the Annual convention at Dayton then made their reports. which were very well received. During the course of these reports the members were told of the appointment of Gerald A. Lux as Research Associate for the society at the Bureau of Standards, Washington, D. C. This was received with a great deal of enthusiasm and everyone was wishing Jerry the best of luck in his new position. The Rochester Branch feels highly complimented by the fact that one of its members was selected for this position. After a little more discussion the meeting was adjourned.

JUDSON R. ELSTER, *Secy.*

Cincinnati Branch held its regular monthly meeting on Thursday evening, June 27th, 1940, at 8:00 P. M., in the Hotel Metropole.

The Membership report was given by Mr. Owen T. Towner, giving the percentage increase in membership for the past year.

Harry Misner of the entertainment committee reported that plans are in the making for a picnic to be held the week after Labor Day. Plans for future events also were disclosed.

The report of the Exhibits Committee was read by the Secretary, as was a letter of thanks sent to all firms that helped to make the Cincinnati Exhibit a success.

The cup was given into the custody of the Secretary with instructions that it be loaned to any member desiring it for display purposes for one week.

A motion was made and seconded that a committee be appointed to consider the advisability of a research committee for the Cincinnati Branch. The following were named on the committee: William Stoddard, Jr., Chairman; William Ehlen; Robert Knoepfler; William Licht, Jr.; R. O. McDuffie.

MARTIN GANNON, JR., *Secy.*

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Philadelphia Branch held its regular monthly meeting at Harrison Laboratory, June 28. President Keller called the meeting to order.

Then the floor was given to the Philadelphia delegates of the 1940 Convention. The papers read at the convention were very well covered by Delegate Zurback, plant visitations and social activities by Delegate Underwood, and business sessions by Delegate Fulforth. Everyone present agreed that the reports of the Convention Delegates were a very good substitute of the Convention. Motion was carried that the reports be received and the delegates be given a rising vote of thanks.

The President of Lancaster Branch, L. A. Critchfield, was present to extend a cordial invitation to members of Philadelphia Branch to the Lancaster picnic in August. George Gehling, Arthur Snow, and J. D. Dimon were appointed to the committee to boost this picnic among the members of Philadelphia Branch. Details to be sent to members of the branch at a later date by the Secretary.

The motion was carried to give F. Fulforth a rising vote of thanks for his splendid work as Editor of the Quaker City Reminder, before his resignation was accepted. Albert Hirsch was appointed Editor for the present year.

A motion was made and carried that the President appoint George Long Chairman of the Banquet Committee. George is to select his own committee at a later date.

The members of Philadelphia Branch who attended the convention expressed their appreciation to Arthur Snow for the good time he showed them at Dayton. A motion was carried that meetings be suspended for July and August. The officers will continue to hold regular monthly meetings to transact routine business.

The next regular meeting is to be held at Harrison Laboratory, University of Pennsylvania, 34th and Spruce Streets, Philadlephia, Pa., Sept. 27, 1940.

JOHN W. HIMES, *Secy.-Treas.*

Springfield Branch held its regular monthly meeting at the Hotel Charles on May 27. It was the best attended monthly meeting the Springfield Branch has ever had. Forty-three members and guests were present.

The President introduced Mr. Donald Wood, Electrochemist of Reed & Bar-

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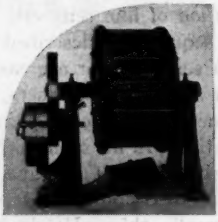

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NEWARK BRANCH

Newark Branch will have their Annual Fishing Trip at Waretown, N. J., on August 3rd., and will hold their Annual Picnic at Vogel's Grove, Liberty Ave., Union, N. J., on September 7th. Admission, $2.00 for Adults; $1.00 for Children. From 10 A. M. till 7 P. M. Menu consists of clams on the half-shells; hamburgers, hot dogs, sausages, tomatoes, radishes, scallions, corn on the cob, beer and soft drinks. All you want, anytime you want it and as often as you want it.

ton Company, Taunton, Mass., who presented a very interesting paper on cleaning prior to plating.

Mr. Wood traced the early history of cleaning from the last century to the present date, stressing the importance of film exchange over the conventional method of film removal. In following the sequence he described the exchange of a soap film for a greasy film in the first and second cleaners, and cathode reduction of the oxide film in the strike solution. In his sequence he has eliminated the use of acid and cyanide dips for all pieces on which the oxide film is mormally thin. He described several strike solutions which may be used, the tin strike being made up of caustic soda, a little sodium cyanide, and a tin anode. Mr. Wood was partial to this particular solution because of its excellent throwing power. In nickel plating steel knives, he recommended a nickel strike composed of nickel salts and muriatic acid.

After the talk, Mr. Wood was kept busy answering questions, and was then given a rising vote of thanks for his interesting and unique paper.

Mr. J. Tierney of Storts Welding Co., Meriden, Conn., displayed several new type anodes for use in alkaline cleaning tanks. They were made of alloy steel with welded copper hooks. They caused many favorable comments.

After considerable discussion on a chemistry course for members of the society, Messrs. Frank Clark, P. W. Prouty, and Arthur Wood were appointed to consider the idea and give their suggestion at the coming meeting.

President Costigan was given a rising vote of thanks for his excellent work on the publicity committee for the Regional Convention. We believe that the success of the convention was due largely to his efforts.

D. S. HARTSHORN, JR., *Secy.-Treas.*

Lancaster Branch held its monthly meeting on Friday June 21 at the Arcadia.

The minutes of the May 10 meeting were read and approved.

Reports were made by the Exhibit Committee, program, membership and entertainment committees. The latter committee announced the date of the Branch picnic as August 10, the location to be decided at a later date.

It was reported by Mr. Critchfield that Mr. Schwalm had received the first prize award for the individual exhibits at the National Convention.

Following the business session, Messrs Critchfield and Klunk outlined the various happenings which took place at the National Convention. Mr. Critchfield discussed the highlights of the various Technical Papers. Mr. Klunk described the various plant visitations which were made by the group.

We were honored with the presence of our newly elected Supreme President, Mr. Fred Fulforth. He outlined several plans for the coming year and the cooperation of the branch societies was solicited in order to help complete the program which has been adopted.

We also appreciated the presence of our other loyal supporters from the Philadelphia Branch, Messrs Snow and Dimon.

H. L. HOVIS, *Secy.*

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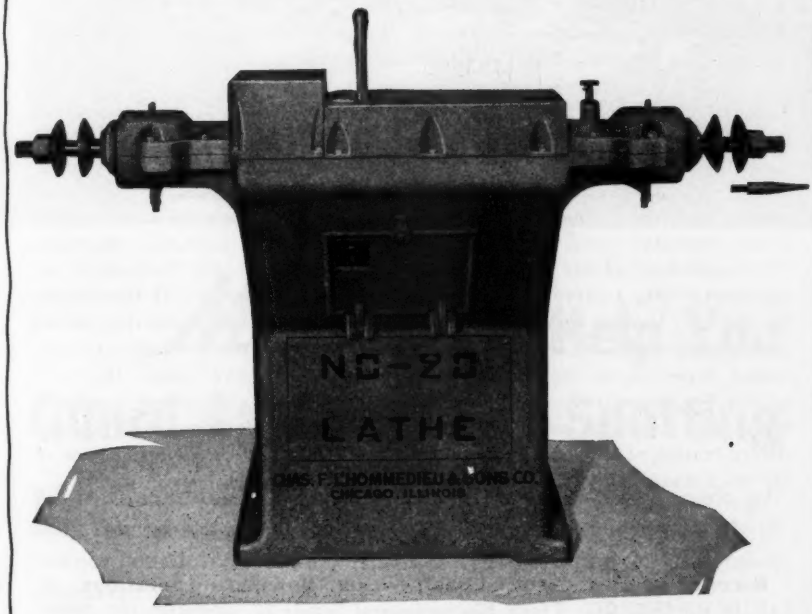

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The Abstract Section

CHARLES C. CONLEY, *Chairman, Program and Educational Committee*

A Graphic Method for the Calculation of the Current Density at a Given Point During Electroplating. By I. YA. BOGORAD. *Korroziya* **4,** No. 2, 155-8 (1938); *Khim. Referat Zhur.* **2,** No. 1, 78, (1939). The determination of the cathode current density at a given point is important to obtain deposits of a definite quality, especially for chrome plating relief surfaces. The graphical method permits determination of the current density from the velocity of deposition of the metal on the cathode, which is measured at the same point. The velocity of the deposition on the surface of the cathode is determined by $S = (KPD^{-})/d \times 1000$ where S is the thickness of the deposit in mm. deposited in one hour, K the electrochemical equivalent, P the current efficiency, D the cathode current density in amp./sq.dm., and d the density of the deposited metal. The formula thus contains two unknown quantities. The dependence of the yield on D is found graphically. On the basis of experimental data a curve is constructed of the yield depending on the current for $D = 1$. Another curve $S = f(D,P)$ is constructed from points determined from the formula and from curve 1; from this the current density is determined, depending on the velocity of the deposition at a given point. By determining the deposition velocity from curve 2 the cathode current density is found, and then from curve 1 the current efficiency is determined. Thus, the determination of the deposition velocity is simplified to the determination of the thickness at a given point by one of the usual methods.

W. R. HENN

Chemical Abstracts **34,** 678 (1940)

Recent History of Certain Cobalt-Nickel Alloy Plating Solutions. By LOUIS WEISBERG. *Trans. Electrochemical Society* **77,** (Preprint 18) (1940). The composition of these "bright nickel" solutions now is: nickel sulfate 32, nickel chloride 4-6, nickel formate 6, cobalt sulfate 0.2-2, ammonium sulfate 0.13-0.33, formaldehyde 0.13, boric acid 4 ozs./gal., pH 2-4, temperature 140°-160° F. The amount of cobalt required depends on the impurities in the solution; better methods of purification permitted reducing the cobalt in the anodes from 18% (corresponding to 1.6-2 ozs./gal. cobalt sulfate in the solution) to 5% (0.6 oz./gal.), resulting in less costly deposits. The troublesome purification by ferric hydroxide precipitation has been superseded by filtration with clay, charcoal, or both, and preferential electrolysis at 2-5 amps./sq.ft; usually 4-8 amps./hr./gal. suffice. Purification is often continuous. The availability of pure nickel formate has made it possible to eliminate the sodium formerly introduced as sodium formate, and this has produced a more ductile deposit. Ammonium sulfate has been reduced for the same reason, but 0.13 oz./gal. are required to obtain the maximum luster without excessive cobalt. On highly finished steel, the buffing required to cover die marks and accidental scratches is cheaper if done after nickel plating, and thus semi-bright, easily

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buffed deposits are desired; only 1% cobalt in the anodes (0.2 oz. in the bath) is then required. Temperatures are higher. The usual pH is 3.7 (quinhydrone electrode) but may be lower for easy buffing. The essential agitation is generally obtained by air introduced through canvas-base synthane pipes.

ERNEST H. LYONS, JR.

Electrodeposition of Metals from Solutions with Sulfamic Acid or its Salts. By ROBERTO PIONTELLI and ALESSANDRO GUILOTTO. *Chimica e industria* (Italy) **21,** 478-91 (1939); *Chemical Abstracts* **34,** 678 (1940). Cf. Abstract Section, *The Monthly Review, American Electroplaters' Society*, September 1939, 726-8. The possibilities of sulfamic acid, HSO_3NH_2, in electrodeposition were first suggested by L. Cambi and R. Piontelli (*Rend. inst. lombardo sci.* **72,** (1938-39). Conditions for obtaining satisfactory deposits of various metals are as follows:

Copper: Dissolve $CuCO_3$ in the acid to give a 1 M. solution of copper. Current densities up to 51 amps./sq.ft. at temperatures of 54°-86° F. At 99° F. and 28 amps./sq.ft. a specular deposit is obtained.

Silver: Dissolve Ag_2CO_3 in sulfamic acid, or mix Ag_2SO_4 with Ba $(SO_3NH_2)_2$. Current densities 3.7-15 amps./sq.ft. at temperatures of 68°-140° F. At 68° and 9.3 amps./sq.ft., the deposits are compact, finely crystalline, and almost as good as those from cyanide solutions.

Iron: 9-93 amps./sq.ft., 63°-122° F. The best deposits are obtained at 63° and 28.8 amps./sq.ft.

Nickel: 6.5-32.5 amps./sq.ft., 63°-104° F. Thin or medium plates were excellent, but extra-heavy deposits tended to flake off.

Lead: 4.6-14 amps./sq.ft., 55°-72° F., 1-2 M. solutions, with fish glue as protective colloid. Deposits are free from Bi, As, Sb, or Sn. The higher temperatures give more compact deposits.

Thorium: Adherent deposits not obtained, but 9.3 amps./sq.ft. at 66° F. gives needle-like deposits which permit the preparation of the pure metal.

Zinc: 7-93 amps./sq.ft., 57°-104° F. Deposits correspond with those from sulfate solutions, with no particular advantage in using the sulfamate.

Cadmium: Behaves like zinc.

Rhodium: 4.6-9.3 amps./sq.ft., room temperature. Solutions contained 10-20 g./l. rhodium and excess free acid. Very good deposits were obtained on copper and platinum cathodes.

All known salts of sulfamic acid except the basic mercury salt are soluble in water. The tin salt is only slightly soluble, while salts of Bi, Sb, and As are unknown. Manganous salts oxidize very readily. Deposits of tin, chromium, manganese, arsenic, antimony and bismuth could not be obtained. Deposition of platinum and gold and analytical applications are still under investigation.

ERNEST H. LYONS, JR.

The Electrodeposition of Silver from Thiosulfate Solutions. By ROBERT WEINER. *Z. Elektrochem.* **45,** 757-9 (1939). Cf. Abstract Section, *The Monthly Review, American Electroplaters' Society*, December 1939, 976. Bright electrodeposits of silver can be obtained from a bath containing 40 g. silver (as AgCl), 170 g. $Na_2S_2O_3.5H_2O$, 20 g. $NaHSO_3$ and 50 g. Na_2SO_4 per

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liter, at current densities of 0.3-0.5 amp./sq.dm. (2.8-4.6 amps./sq.ft.). The $NaHSO_3$ prevents oxidative decomposition of the silver-thiosulfate complexes, and the Na_2SO_4, which may be replaced by chloride, acetate, or citrate, facilitates solution of the anode. NH_4Cl, Na_2CO_3, NaOH, NaCNS and NH_3 are harmful, but cyanide and phosphate have a small beneficial effect. Capillary-active substances, e.g., Turkey-red oil, and colloids have little or no effect on the deposits.

S. GLASSTONE

Chemical Abstracts **34,** 678 (1940)

Barrel Polishing. E. G. WEST. *J. Electrodepositors' Tech. Soc.*, **15**, 185-194 (1939). The subjects reviewed are: the design and materials of construction of barrels, the motion of the barrel, the types of abrasives and liquid media used; methods of drying the finished product.

A. BRENNER

A Suggested Basis for Specifications of Electroplated Coatings of Nickel and Chromium. A. W. HOTHERSALL (Woolwich). *J. Electrodepositors' Tech. Soc., Vol.* **15,** 1939; p. 195-204. The British Non-ferrous Metals Research Association has suggested specifications to assist their members in framing their own detailed specifications. These specifications cover the requirements for decorative or protective electrodeposited coatings of Ni and Cr on steel or on copper alloys containing more than 50% Cu. The coatings must be free from imperfections such as blisters, pits, cracks, etc. Three qualities of Ni plating are specified and they differ with respect to the minimum thickness of coating on a significant surface.

Quality	Service Conditions	Minimum Thickness of Undercoating (inch)	
		On Brass (Nickel)	On Steel (Nickel or Nickel-Copper, Nickel or Bronze-Nickel)
A	Mild	0.0002	0.0004
AA	General	0.0004	0.0008
AAA	Severe	0.0006	0.0008

The average thickness of coating would usually be two or more times the minimum thickness. The porosity of AAA quality plating, as determined by the ferricyanide test should be less than 6 pores/sq. ft. Chromium should always be applied over a Ni undercoating and should have an average thickness of 0.00002 in. for qualities A and AA and a thickness of 0.00004 in. for the AAA quality. It is suggested that significant surfaces be defined as surfaces which can be touched by a ball 0.75 in. in diameter. The BNF jet test is suggested as a minimum thickness test for Ni coatings. A sample fails if the coating falls below the required minimum thickness at 2 points more than 0.5 in. apart. The thickness test for Cr consists in measuring the time required for a reagent (20 g. of Sb_2O_3 in 1 l. of HCl of sp. gr. 1.16) to dissolve the Cr coating.

A. BRENNER

Electrodeposition of Nickel From Nickel Chloride Solutions. W. A. WESLEY and J. W. CAREY. "*Products Finishing*," Feb. 1940, pp. 9-20.

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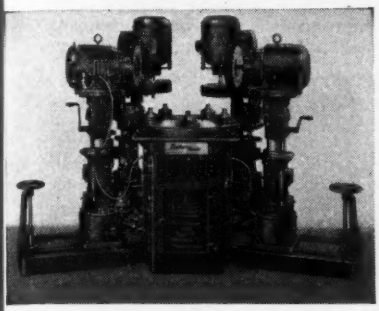

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Discusses work done at International Nickel Co. Although refiners have used nickel chloride baths for some time, it is only recently that platers have become interested. Solution used was $NiCl_2$ 6 H_2O—300 g./l., boric acid 30 g./l. Nickel chloride was first purified by agitating its water solution with nickel carbonate and then with chlorine gas. Solution diluted to give 75 g./l. of metallic nickel. pH used ranged from 1.0 for semi-bright deposits to 4.0 for dark matte deposits. Temperature used was 130°-140° F. and current densities of 50-100 A/SF. No additions to prevent pitting were made but it took two days before deposits were free of pits. Bath has extremely wide range, cracked deposits being experienced only at high current density and high pH. Deposits from all chloride baths were found to be much finer than from Watts Nickel Sulfate bath. With thick deposits (0.3 inch) the deposits were freed badly from sulfate bath, (pH equals 4.0), while chloride baths were notably free. Metal distribution and throwing power seemed better in chloride bath. All chloride deposits were finer grained, harder, and had less nodules on them. Even dark matte deposits were sound metal. Baths show promise for thick deposits.

PHIL J. RITZENTHALER

Barrel Finishing of Metal Products. H. LEROY BEAVER, "*Products Finishing*," Feb. 1940, pp. 42-46. *Discussion of Mechanics of Barrel Finishing.* Previous assumption that parts in a burnishing barrel are equally distributed throughout barrel was found by author to be false. Examination of wooden liners show wear at varying points on arc of side liner. Wear showed that different parts travel at different distances from center, depending on centrifugal force, resistance to movement, etc. Speed of barrel is very important. Parts which bump and distort at 24 RPM for example, do not bump or distort at 18 RPM. Author repeats assertion that distortion in barrel finishing is due to wrong speed, not to too great a load. Another contributing factor to distortion is too small a quantity of burnishing material. Also underloading results in lack of cold working and hence improper finish. Author also calls attention to unsolved problem of porosity on plated coatings. Claims that cold flow in barrel burnishing will decrease porosity and thus permit thinner and better coatings. The cold working to increase surface hardness and plastic flow to close up pores called chief benefits of burnishing.

PHIL J. RITZENTHALER

The Structure of Heavy Electrodeposits of Copper and Nickel. By J. W. CUTHBERTSON. *Trans. Electrochemical Society* **77**, (Preprint 8) (1939). Photomicrographs of heavy copper electrodeposits on copper wire from an acid sulfate bath at an average current density of 4.7 amps./sq.ft. show a fibrous structure oriented perpendicular to the cathode surface, and not continuing the crystal structure of the basis metal. X-ray diffraction photographs and Brinnell hardness measurements show confirming directional variations. As deposited, the metal is under somewhat severe internal stress, although fairly soft; it is further softened by annealing one hour at 1569° F. Thin bands or layers roughly parallel to the cathode surface, due to current interruptions during deposition, apparently do not interrupt the crystal structure, nor injure the properties of the metal except to cause brittleness after annealing, although

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without marked influence on the recrystallization of the metal. They seem to be inclusions of finely divided copper, deposited by the changing cuprous-cupric ion equilibrium as the solution cools, and cuprous oxide, from oxidation by dissolved air or hydrolysis of cuprous ions. The effect of the arrangement of anodes in producing structural weaknesses in the deposit is discussed. A nickel deposit (0.1-0.5 in. thick) showed wide variations in grain size and orientation ascribed to local fluctuations in current density over the cathode. On annealing at 1720° F., although the metal became softer it lost ductility and developed serious intercrystalline brittleness, attributed to the segregation of nickel oxide included in the deposit. X-ray diffraction studies showed an intense though unstable fibrous structure perpendicular to the cathode.

ERNEST H. LYONS, JR.

Chromium-plating of Zinc and its Alloys. By M. SCHLÖTTER. *Metallwirtschaft* **18**, 551-2 (1939). Peeling of chromium plate, formation of fissures and similar surface irregularities, etc., are due to the presence of free hydrogen, which can be neutralized by the use of an undercoat of nickel or cobalt, or, better still, by undercoating with zinc.

A. H. KRAPPE

Chemical Abstracts **33**, 6724 (1939)

Improvement in the Acid Sulfate and Fluoborate Cadmium Baths so that They may Replace the Cyanide Bath. By V. I. LAINER, S. I. ORLOVA, and A. M. FAIGEL'SHTEIN. *Korroziya* **4**, No. 2, 96-114 (1938); *Khim. Referat. Zhur.* **2**, No. 2, 138 (1939); *Chemical Abstracts* **34**, 944 (1940). The coarse crystalline deposits obtained from acid cadmium baths are attributed to insufficient cathodic polarization, and colloids were added to remedy this. The iron cathodes were pickled in concentrated HCl, degreased with Vienna lime, and washed. Recommended bath: $CdSO_4.^8/3H_2O$ 64, $(NH_4)_2SO_4$ 33, $Al_2(SO_4)_3.18H_2O$ 28 g./l. Temp. 64-68° F. Plates were 0.00034 inches thick, and cathode efficiencies 96-98%. Peptone gave the best deposits at 4.6-9.3 amps./sq.ft., pH 2-3.2, and 0.5 g./l. peptone. Best deposits with creosol were obtained at 8 g./l., pH 1.5-3.3, 4.6-7.4 amps./sq.ft. The best addition agent was glue, 0.5 g./l., 4.6-9.3 amps./sq.ft., pH 3.0-5.5. The fluoborate bath recommended is: $Cd(BF_4)_4$ 143, HBF_2 35, glue 1 g./l., 122° F., 83-93 amps./sq.ft. Current efficiency was 96-98%. This bath permits the use of a high current density. The throwing power in both acid baths is smaller than in the cyanide bath, but plates are fine-grained and equally resistant to corrosion.

ERNEST H. LYONS, JR.

Pretreatment of Steel for Nickel Electroplating. By W. BALLER. *Schweiz. Arch. angew. Wiss. Tech.* **4**, 289-92 (1938). The article to be plated is immersed as the anode in 37% H_2SO_4 with a current density of 10 amp./sq.dm. (93 amp./sq.ft.) until a light-gray surface is obtained. The treatment is repeated until a dark or black color is obtained. A bright surface is next obtained by pickling in a H_3PO_4-H_2CrO_4 solution, and immediately plated in a solution of 300 g./l. $NiSO_4.7H_2O$, 50 $MgSO_4.7H_2O$ and 17 H_3BO_3 with a current density of 3 amps./sq.dm. (28 amps./sq.ft.)

A. LLOYD TAYLOR

Chemical Abstracts **34**, 31 (1940).

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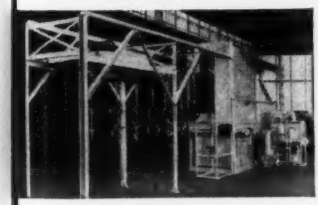

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Chromium-Plating Baths Containing Fluoride Ions. By YU. V. BAIMAKOV, K. P. BATASHEV, and D. M. TELENKOV, *Trans. Leningrad Ind. Inst.* **1938,** No. 1, Sect. Met. No. 1, 27-35. The baths contained 250 g./l. of CrO_3, 0.5-10 g./l. of NaF and less than 1 g./l. of sulfate. Temperatures were 15°-45° C. (59°-113° F.) and current density 1-5 amps./sq.dm. (9-45 amps./sq.ft. Best deposits were obtained in baths containing 2-5 g./l. of NaF and at a current density of 1-5 amps./sq.dm. (9-45 amps./sq.ft.), while in some cases bright deposits were obtained with a current density of 0.5 amps./sq.dm. (4.1 amps./sq.ft.). Deposits obtained at 18°-30° C. (65°-86° F.) were bright. Maximum thickness of these deposits was 6-8 microns (0.00023-0.00031 inches). The throwing power of the bath containing CrO_3 250 g. and NaF 5 g./l. was determined at 21°-22° C. (70-72° F.) and at a current density of 3 amps./sq.dm. (27 amps./sq.ft.). With increasing temperature the throwing power dropped and at 35° C. (95° F.) it was 16%. Lead anodes deteriorated rapidly; platinum and magnetite (treated in a chromium bath for 48 hours) anodes were good for long periods. B. Z. KAMICH

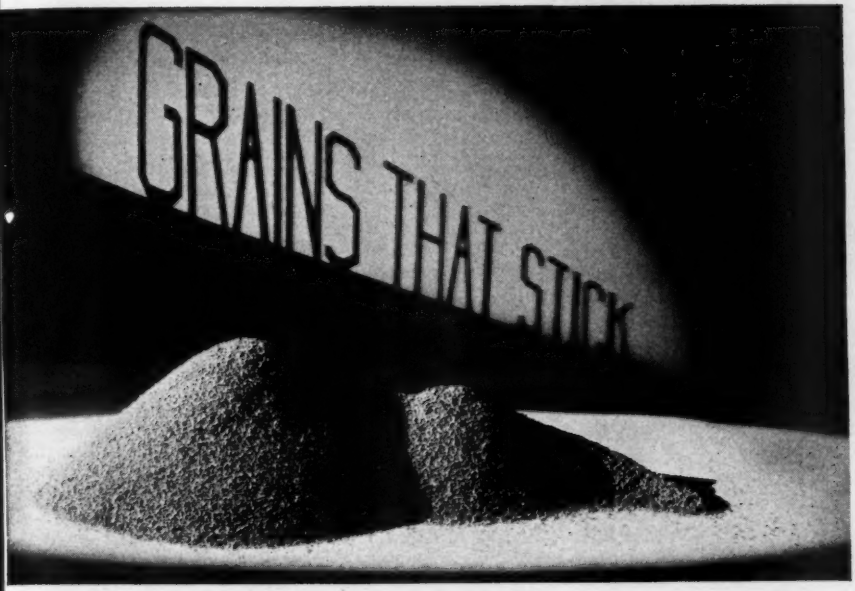
Chemical Abstracts **34,** 944 (1940)

Electrolytic Polishing. Review of Jaquet Method. *"Tech. Moderne,"* Vol. **31,** August 15, 1939. It has been found that most metals can be electrolytically polished by anodic attack. Work is usually rough finished by conventional methods. Solutions used are as follows:

		Electrolyte	Current Density amps./dec²
1.	Copper	Comml. H_3PO_4 (sp. gr. 171)	9-10
2.	Brass (single phase)	H_3PO_4—430 g./l.	9-10
3.	Brass (double phase)	H_3PO_4—530 g./l.	9-10
4.	Cobalt	H_3PO_4—sp. gr. 1.35	9-10
5.	Zinc	H_3PO_4—25% soln.	16
6.	Aluminum and Alloys	Perchloric acid (sp. gr. 1.480) plus pure glacial acetic	5-9
7.	Tin or Lead	194 c.c. perchloric (sp. gr. 1.60) plus 805 c.c. glacial acetic	10
8.	Iron or Low Alloy Steel	185 c.c. perchloric acid (sp. gr. 1.60) 765 c.c. glacial acetic 10 c.c. water	4-6
9.	Special Steels	335 c.c. perchloric acid (1.60) 665 c.c. glacial acetic	6-7
10.	Nickel	210 c.c. perchloric acid (55°Be) 790 c.c. glacial acetic	50

PHIL J. RITZENTHALER

Rapid Method of Anodic Oxidation of Aluminum and its Alloys. By F. V. KOZLENKOV. *Aviapromyshlennost* **1939,** No. 6, 32-8. Up to 1938, the Bengough and aloxal methods of anodic oxidation of aluminum and its alloys were used extensively in Russia. In 1938 a rapid method (30 minutes) of anodic oxidation in 10% chromic acid was introduced. The specimen is cleaned,



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washed in water and made the anode at 37 ± 2° C. (99 ± 3° F.) at a constant voltage of 40 volts and a current density of 0.3-0.4 amps./sq.dm. (2.8-3.7 amps./sq.ft.). Best results are obtained at a pH of 0.12 to 0.60-0.70 and a specific electrical conductivity of 0.1400-0.0900 at 37° C. (99° F.).

B. Z. KAMICH

Chemical Abstracts **34,** 677 (1940)

Nickel Plating on Cast Iron. By J. LEMENS and J. DUPONT. *Ing. chim.* **23,** 73-104, 120-141 (1939); *Chemical Abstracts* **34,** 31 (1940). Best conditions, apparatus, and methods of analysis are described. A bath of 80% sirupy technical phosphoric acid and 20% sulfuric acid (53° Be.) gave good results with castings which were difficult to plate. The nickel bath was: $NiSO_4.7\ H_2O$ 300-350 g./l., H_3BO_3 20, NaCl or NH_4Cl 12, H_2O_2 (12%) 1-2 cc./l., current density 75-140 amps./sq.ft., temperature 122° F., pH 4-5. With rough cast surfaces, the current density should be reduced in proportion to the irregularity of the surface. Adherent deposits were obtained .00136 inches thick. Sixteen references. ERNEST H. LYONS, JR.

IMPROVED BLACK FINISH ON STEEL

An improvement has recently been developed in the Jetal process for applying a black, corrosion- and rust-resistant finish to steel. The process has been changed to a two-bath system which yields a deeper black coating and, at the same time, simpler manipulation and control of the solution.

Two tanks of ordinary iron or steel are required for Jetalizing. (No brass or copper fittings should be used.) The first, or "A" tank, should be kept at 280°-290° F., and the second, at 305°-315° F.

Three water-rinsing operations are involved, which may be carried out in one or more steel tanks. The water containing the drag-out should be used to replace evaporation losses from both Jetal tanks, but the iron in this drag-out water must be removed before it is returned to the system, either by filtration or by allowing the iron precipitate to settle and siphoning off the clear water. It is customary to use a final hot rinse to speed up the drying operation, but drying in warm air is also practicable.

All steels, except those high in nickel or chromium, can be colored black by the Jetal process. (Cast iron and some special steels may require deviations from the routine process.) The first step is to remove excess grease or oil from the work in a suitable cleaning solution. Then, dip the work in the alkaline rinse water containing the drag-out. In many cases, such as with hardened steel surfaces, it is advisable to give the cleaned work a short dip in cold dilute acid to secure a deeper black in a shorter time. Heavy scale or rust should be removed in a pickel. The acid dip must be followed with a water rinse before placing the work in the drag-out rinse. From the drag-out rinse, the wet work is placed immediately in the Jetal "A" tank and kept there until some coloration is noted. The work is then removed, rinsed in cold water and immediately placed in the Jetal "B" solution where it remains until the desired depth of black is obtained. This operation is followed by a rinse in the cold drag-out tank, and then with another cold rinse, and finally the hot rinse, to remove the final traces of the Jetal solution. The last rinse may be in hot water alone or in hot water containing 6 percent or more of a suitable soluble oil in order to obtain dry finished work of excellent appearance.

The time required for the Jetal dips varies with the class of work, but in general, ranges from about two minutes to five minutes in each tank.

Full details of the operating methods, manipulation and control of solution, etc., are obtainable from the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies.